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Aalto University
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and Architecture

A systems approach to sustainability in higher education:

*Analysis of undergraduate architectural education
in Kazakh Leading Academy of Architecture
and Civil Engineering in Kazakhstan.*

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Cover: Hotel Kazakhstan, a famous landmark and an iconic building of Soviet-time architecture in Almaty, Kazakhstan (photo: Nsanbaeva, 2018).

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Abstract

Purpose. The research explores the broad topic of sustainability in higher education by focusing on the undergraduate architectural education in Kazakhstan. Specifically, the case study examines Kazakh Leading Academy of Architecture and Civil Engineering (KazGASA), a leading higher educational institution in Kazakhstan in the field of architecture, design and construction. It started with the questions: *What is the status of sustainability initiatives in KazGASA?, following up with What are the leverage points within KazGASA as a system that could potentially lead to large changes towards sustainability education?*

Methodology/ approach. From the design research perspective, it is a theoretical thesis; and the overall approach was based on empirical case study research. 14 interviews with students, faculty and academic administration members in KazGASA were conducted during 2 field trips. The systems approach is used to analyse data from interviews; and identify feedback loops, system archetypes, mental models, and barriers and opportunities for the integration of sustainability in KazGASA.

Findings. Currently, sustainability topics are only moderately represented in KazGASA having some topics related to sustainability within the existing courses. There is a lack of importance from the Ministry of Education and Science, and sustainability is not considered as a priority. However, ongoing changes in the education of the country, which include academic freedom and international accreditations, offer an opportunity for HEIs in Kazakhstan to develop new study programmes and have organisational independence. Using leverage points by D. Meadows (1999) as a tool, the research identifies intervention places and suggest recommendations that could instigate transformation process in KazGASA towards sustainability education.

Originality/ value. While there are many case studies about sustainability in HEIs or sustainability in architectural education, based on the search in international peer-reviewed journals, no such studies were conducted in Kazakhstan. There are scarce research papers on the state of sustainability initiatives in government and education system in Kazakhstan and Central Asia generally. Therefore, on a broader sense, the research offers unique country-based perspective by looking into the literature review on SHE and architectural education, as well as strategic plans by the government of Kazakhstan and the Ministry of Education and Science.

Keywords *sustainability, sustainable development, higher education, sustainability in higher education, sustainability in architectural education, systems approach, systems thinking, leverage points, sustainability in Kazakhstan, education system in Kazakhstan, architectural education in Kazakhstan, KazGASA.*

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Abbreviations

- ESD – Education for Sustainable Development
- HEI – Higher Educational Institution
- KazGASA – Kazakh Leading Academy of Architecture and Civil Engineering (Kazahskaya Golovnaya Arhitekturno-Stroitel'naya Akademiya)
- MES – The Ministry of Education and Science of the Republic of Kazakhstan
- RK – Republic of Kazakhstan
- SD – Sustainable Development
- SDG – Sustainable Development Goals
- SHE – Sustainability in Higher Education
- UN – United Nations
- UNDP – United Nations Development Programme
- UNESCO – United Nations Educational, Scientific and Cultural Organisation

Introduction

The start of the journey

In 2006, after high school, I was accepted to an undergraduate architecture programme in Kazakh Leading Academy of Architecture and Civil Engineering (short KazGASA¹) with the full government scholarship. However, after one year disappointed with the quality of education, I left my home country Kazakhstan to pursue bachelor's degree in Environmental Design in Canada, and afterwards master's degree in Creative Sustainability in Finland. Over the years, my career and personal interests shifted from built environment design towards sustainability challenges. The experience in Creative Sustainability programme at Aalto University helped to increase my understanding of sustainability challenges and clarify my stand in a collective response to those challenges.

My situation is privileged. Due to my family's financial stability, I was able to pursue education abroad and expand my worldview. Not everyone in

1. Abbreviation KazGASA comes from the name of the academy on Russian, but it is used as an official short name on English too.

Kazakhstan has the same opportunities. Therefore, this research has started with the belief that improving educational experience is a crucial factor to increasing the country's well-being and enabling a societal shift towards sustainability paradigm.

Research Objectives

United Nations (UN) members adopted 2030 Agenda for Sustainable Development consisting of 17 Sustainable Development Goals (SDG) in 2015. It is a crucial political agreement between world leaders to end poverty, eradicate inequality and mitigate climate change (UN, 2015). Education is an essential factor for the success of 2030 Agenda with its own dedicated *Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all* (Figure 1) (UN, 2015).

The Republic of Kazakhstan became full UN member in 1992 (UN in Kazakhstan, n.d.), and together with other leaders, President Nursultan Nazarbayev has signed 2030 Agenda (e.gov, 2017). Despite discussion on the government level, the country



Figure (1) UN Sustainable Development Goals (UN, 2015)

uses only 1% of renewable energy (Dzhalilova, 2018) while being one of the world's leading producers of coal, oil and gas. Most importantly, the concept of sustainable development is still unfamiliar to Kazakhstani citizens.

In 2010, Kazakhstan signed the Bologna Declaration, and there have been continuous efforts to revamp the country's education system to meet international standards. Changes happening in the education system is an opportunity for Kazakhstan to increase integration of sustainability paradigm into everyday life.

A transition towards sustainability on a societal level is a complex and broad topic to tackle. Therefore, due to my professional background in design, this research aims to explore the integration of sustainability in undergraduate architectural education in Kazakhstan.

To further narrow down the topic, it is an empirical case study focusing on the specific higher educational institution - Kazakh Leading Academy of Architecture and Civil Engineering. Despite my personal experience, KazGASA is the leading HEI and ranked first in the fields of architecture, design and construction in Kazakhstan. The academy heads a curricula-methodological union of architectural schools in the country and, consequently, influences curricula of other schools.

The undergraduate level was chosen because the conversation about design and its role in sustainable development often happens on graduate level (masters or doctoral studies). However, only the fraction of architecture students in Kazakhstan decides to advance their education. A graduate degree is not a requirement to practice architecture in the country; the qualification is given based on relevant required experience. Also, in KazGASA the cost of a graduate degree is around 2000 euro per year (KazGASA, n.d.).

From the design research perspective, it is a theoretical thesis using a systems approach to analyse the research findings. I acknowledge that the research lacks tangible designerly component. However, it uses multidisciplinary and systems approaches, which are key learning outcomes of Creative Sustainability Programme.

It is also worth noting that the research shaped itself. I started this journey with designerly outcomes in mind, which proved to be unnecessary. On the other hand, I discovered some intrinsic insights, leading to reconsideration of my initial assumptions.

Research Questions

The research started with the questions:

- What is the status of sustainability initiatives in KazGASA?
- Who are the stakeholders in KazGASA?
- How does the decision-making process happen in KazGASA?
- What is the level of integration of sustainability topics in undergraduate architectural education experience in KazGASA?
- Where are the opportunities and barriers for integration of sustainability in KazGASA?

Based on the literature review and findings, the research examines higher educational institutions (HEIs) as a system, which can be managed by applying systems thinking.

As mentioned above, the systems approach is used in this research to analyse data from interviews, identify barriers and opportunities to the integration of sustainability in KazGASA, and propose intervention places that could instigate transformation process in KazGASA towards sustainability education. Therefore, a final research question:

- What are the leverage points within KazGASA as a system that could potentially lead to large changes towards sustainability education?

If simplified, in case of this research an undesired system state is KazGASA as HEI without consideration of sustainability problems, which continues to operate in the traditional linear way of thinking. A desired state of the system is KazGASA as HEI that promotes and embodies sustainability education by infusing it in all decisions regarding research, education, university's operation and partnership with outside communities.

Thesis Structure

Chapter 1: Background gives a brief overview of the Republic of Kazakhstan; the role of building sector in the world's and Kazakhstan's energy consumption; and connects the building sector with architectural profession and education.

Chapter 2: Theoretical Background expands on the topic started in the Introduction and Chapter 1. Specifically, the chapter is divided into two main sub-chapters: 1) Thematic Literature Review and 2) Education System in Kazakhstan. The first sub-chapter examines various research papers concerning the integration of sustainability in higher education and comprehends three major themes: sustainability in higher education, integrating sustainability in higher educational institutions and sustainability in architectural-design education. The second sub-chapter presents secondary research on government strategies and the education system in Kazakhstan, as well as introduces the reader to KazGASA.

Chapter 3: Material and Methods introduces first the principles of systems thinking by reviewing the systems vocabulary. Afterwards, the second sub-chapter examines in detail research questions, research methods, the research timeline, data gathering process and data analysis.

Chapter 4: Research Results presents the reader with research findings, looking into KazGASA as the organisation; the decision-making process in KazGASA; the state of sustainability topics in the

current educational experience, including barriers and opportunities to the integration of sustainability in KazGASA. To support the findings, the chapter includes snippets from the original interviews.

Chapter 5: Discussion aims to connect thematic literature review with research results. A systems approach is used to analyse KazGASA as a system and identify leverage points that could potentially lead to significant changes towards sustainability education.

Chapter 1.

Background

1.1 Kazakhstan overview

The Republic of Kazakhstan is located in Central Asia, bordering with such powerful countries like Russia and China. It is the 9th biggest country in the world, but with a population of around 18 million people, the country has one of the smallest population densities. Kazakhstan is a former Soviet country gaining independence in 1991. Due to colonisation and historical use of the country by Russia for deportation of dissidents and relocation of unfavourable minorities, Kazakhstan is a multi-ethnic country with two official languages - Kazakh and Russian. Consequently, there is still a strong influence of the Soviet system in government structures including the education system.

The country has a 99.8% literacy rate and currently is ranked 58th (out of 189 countries) in the UN Human Development Index (UNDP Human Development Report, 2018). However, Kazakhstan is consistently ranked low in the Corruption Perception Index of countries, partly due to authoritarian power regime set by President Nursultan Nazarbayev, who has held the position since 1989 (Transparency International, n.d.).

Nevertheless, over the last 20 years, Kazakhstan has built the largest and strongest economy in Central Asia and steadily increased its human development index. The country's economy is dependent on natural resources: oil, which is the primary driver of economic growth; uranium - the country has the world's second-biggest uranium reserves (World Nuclear Association, 2018); natural gas, and mining (World Bank, n.d.).

Since independence, Kazakhstan has gone through extensive economic reforms and faced the challenge of adopting new social and environmental policies (Kukeyeva, Delovarova, Ormysheva, & Davar, 2013). There have been four stages of reforming education policy. The last stage has started in 2001 and consists of the implementation of the three-level model (bachelor, master, doctorate) and credits system (Kukeyeva et al., 2013). In 2010, Kazakhstan signed the Bologna Declaration (IQAA, n.d.), and

in 2015 the country adopted the UN 2030 Agenda (UN, 2015). However, "education has been viewed as a completely separate issue from the economic and environmental sustainability" of the country (Kukeyeva et al., 2013, p. 154), and the country's commitment to SDGs has not moved beyond the discussion on the government level.

Overall, the integration of sustainability and sustainable development into the education system of Kazakhstan requires in-depth examination, which is beyond the scope of this research.

1.2 Architecture & sustainability

According to the *Climate Change 2014, Chapter 9: Buildings* report by Intergovernmental Panel on Climate Change (IPCC), “in 2010 buildings accounted for 32% of total global final energy use, 19% of energy-related GHG emissions (including electricity-related), and approximately one-third of black carbon emissions” (Lucon et al., 2014, p. 675).

Buildings have a long life-span with a risk of significant lock-in - 80% of 2005 energy use in buildings globally will be ‘locked in’ by 2050 for decades (Lucon et al., 2014); therefore, everything we build now should be designed with the consideration of the energy requirements of the future. Improving the quality of buildings positively correlates with enhancing the quality of life and health safety as more people have access to adequate housing and electricity; however, as the climate gets warmer more energy is needed for cooling buildings (Lucon et al., 2014).

The most environmentally and cost-effective policies for efficiency improvements of buildings include “building codes and appliance standards with strong energy efficiency requirements that are well enforced, tightened over time, and made appropriate to the local climate and other conditions have been among” (Lucon et al., 2014, p. 675).

In Kazakhstan, the conversation about energy-efficiency of buildings is relatively recent since the adoption of the law on “Energy saving and increasing energy-efficiency” in 2012 (Paragraf, 2016). In the same year in cooperation with United Nations Development Programme (UNDP), the country updated building regulations by establishing requirements for energy efficiency of buildings, rules for revising energy efficiency classes of buildings, and requirements for energy saving and energy efficiency for pre-project documentation of new construction and renovation of existing buildings (zakon.kz, 2012).

Designers and architects should play a high profile leadership role in the process of transforming building sector towards sustainable development paradigm; and accelerating the degree of integration of sustainability principles into the design education is a pivotal step (Glyphis, 2001). Technological innovation in the built environment sector should be combined with more responsible design strategies and methodologies (Altomonte, 2008). Royal Institute of British Architects states that “architects can influence the sustainability of project outcomes by integrating traditional creative and technical skills with an up-to-date understanding of environmental, social, and economic impacts” (RIBA, 2017, p. 7).

The next chapter *Theoretical Background* gives more detailed literature review of sustainability in higher education, including architectural-design education.

Chapter 2.

Theoretical
background

The chapter discusses the theoretical background consisting of thematic literature review, summary of government strategies and education system in Kazakhstan, as well as secondary research on KazGASA.

2.1 Thematic Literature Review examines various research papers' perspectives concerning integration of sustainability in HEIs and comprehends three major themes:

- *2.1.1 Sustainability in higher education* section starts with the discussion of terms: sustainability, sustainable development, education for sustainable development (ESD) sustainability in higher education (SHE); and aims to identify characteristics of sustainability education.
- *2.1.2 Integrating sustainability in higher educational institutions* explores university as an organisation; what organisational characteristics universities possess; areas of practice that should be embraced in university-wide transformation towards sustainability; and introduces the topic of organisational change in HEIs. Next, the section classifies barriers and opportunities from the literature review to integration of sustainability initiatives in HEIs. Finally, the section describes two case studies and Sustainable University Model by Velazquez, Munguia, Platt, & Taddei (2006).
- The final section, *2.1.3 Sustainability in architectural-design education* explores research papers that specifically focus on the integration of sustainability topics and initiatives within architectural education.

The next subchapter *2.2 Education System in Kazakhstan* provides:

- (2.2.1) Background review on Kazakhstan and UN; and important government strategies such as Strategy 2050 that affect the popularisation of sustainable development on the national level.
- *2.2.2 Education Kazakhstan*: joining the Bologna process and strategic plan of the Ministry of Education and Science for 2017-2021.

The final sub-chapter (2.3) introduces the reader to the background information about KazGASA.

2.1 Thematic Literature Review

2.1.1 Sustainability in higher education

In 2015, UN Member countries adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (UN, 2015). According to UNESCO, education is not only an integral part of sustainable development, but also a key enabler to achieve 2030 Agenda for Sustainable Development (UNESCO, 2017). For individuals to become sustainability change-makers, they need to be empowered through knowledge, skills, values and attributes (UNESCO, 2017).

Orr (1991) argues that the current state of the world is the result of decisions made by people with higher education (as cited in Lidgren, Rodhe, & Huisinigh, 2006) - leaders, decision-makers, scholars, entrepreneurs (Lozano, 2006 as cited in Ferrer-Balas et al., 2010). Universities may not have a direct relation to sustainability issues, but they may contribute to them through the production and transmission of knowledge (Coincenção et al., 2006 as cited in Ferrer-Balas et al., 2010). Therefore, higher education institutions bear a moral responsibility to increase the awareness, knowledge, skills, and values needed to make a vision of sustainable future into reality (Cortese, 2003).

Although many universities around the world have committed to promoting sustainable development, sustainability in higher education is a complex topic to tackle.

Defining terms

One of the key controversies related to the concept of sustainability in higher education is the definition of the term itself (Viegas et al., 2016). Terms sustainability and sustainable development are often used interchangeably. Brundtland Report "Our Common Future" introduced the term sustainable development: "Humanity has the ability to make development sustainable to ensure

that it meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987).

Sustainable development can be interpreted as "sustained growth" or "development that can be continued - either indefinitely or for the implicit time period of concern" (Lélé, 1991, pp. 608-609). The concept consists of both terms "sustainability" and "development". In its conventional interpretation, sustainable development is based on three dimensions - environmental, social and economic. Lélé (1991) expresses concern that the term is in danger of becoming a fashionable cliché and better articulation and clarification of the term is needed to gain political strength and broad social acceptance. Adoption of 2030 Agenda brought a relative global political agreement on sustainable development goals, but whether it has reached masses and social acceptance remains questionable.

Sustainability is a more complex term to define. According to Lélé (1988), the concept came from the context of renewable resources such as forests or fisheries and has subsequently transformed into its broader meaning (as cited in Lélé, 1991). Within its modern interpretation, one can argue that it is impossible to define sustainability as the concept is relative, and understanding and perception of sustainability could differ depending on an interpreter. Sustainability is a wicked problem² which involves dealing with ambiguity, complexity, multiple stakeholders, worldviews and values (Martin et al., 2008 as cited in Cebrián, Grace, & Humphris, 2013); and it is built on the complexity and dynamics of ecological and socioeconomic aspects of human life (Viegas et al., 2016). According to Sterling (2010, p. 512), "sustainability

2. The term wicked problem was coined by Horst W.J. Rittel and Melvin M. Webber in 1973. It refers to a problem that is difficult or impossible to solve and has no definitive formulation. There are no right or false solutions to the wicked problem and no templates to follow (Rittel & Webber, 1973). Every wicked problem is unique and is a symptom of another problem. Environmental degradation and depletion of natural resources are wicked problems, as well as social, policy and organisational problems.

implies the survival, the security, and beyond these, the well-being of a whole system, whether this is seen at local level, such as community, or at global level". To counterpart, Fry defines *unsustainability* as "a condition that is reducible to a damaged global environment and its ecologies. It is equally: a notion of an economy based on perpetual growth" (Fry, 2011, p. 19).

In education, the terms sustainability and sustainable development also evolved over the years. UN Conference on the Human Environment, held in Stockholm in 1973 was the first international conference with the subsequent declaration that identified education as an important factor in addressing environmental challenges (those were not yet defined as part of 'sustainability') (Sterling 2004, Wright 2002).

The terms education for sustainability (EFS) and education for sustainable development (ESD) emerged around the time when Rio de Janeiro Earth Summit was held in 1992 (Sterling, 2004). The result of the summit was Agenda 21, which specifically addressed issues related to sustainability in Chapter 36. The core three goals included reorienting education towards sustainable development; increasing public awareness of environmental issues; and promoting environmental training among educators (Wright, 2002).

Sterling (2004) uses the term 'sustainability education' to comprehend all other terms referring to sustainability, environmentalism, and development studies in education. He defines it as "a broad term that suggests a holistic educational paradigm concerned with the quality of relationships rather than a product, with emerging rather than predetermined outcomes" (Sterling, 2004, p. 43). Sustainability in higher education (shorthand as SHE) is used instead of ESD to include more institutional/ organisational context in favour of sustainability in relation to curricula (Hoover & Harder, 2015).

Sustainability education

Sterling (2010) describes two fundamental approaches to sustainability education: instrumental and intrinsic view. In instrumental view, the education is seen as an agent to achieve more sustainable lifestyle based on the rational assumption that the knowledge about environmental issues will lead to personal and behavioural change, which can result in social change (Sterling, 2010). The instrumental approach is more dominant when teaching about sustainability in higher education, for example, focussing on natural resources depletion (Lozano, 2006a as cited in Viegas et al., 2016). The intrinsic view, on the other hand, stresses the intrinsic values of education, the quality and depth of learning experience that encourages critically reflective learning to make more informed decisions (Sterling, 2010). The differences between those approached, according to Sterling (2010, p. 515), explains "the relative lack of significant progress in sustainability education".

Viegas et al. (2016) identify the critical attributes of sustainability in higher education (SHE). In Philosophy attribute of SHE, Viegas et al. (2016) mention the distinction between weak and strong sustainability (Haughton & Hunter, 1994 as cited in Hopwood, Mellor, & Obrien, 2005) and reformist and transformist views (Hopwood et al., 2005). Weak/ reformist while being critical about the current state of business and government policies, do not necessarily promote fundamental transformation. Strong / transformist, on the other hand, advocate for profound social changes and fundamental system change (Hopwood et al., 2005 as cited in Viegas et al., 2016).

Interdisciplinarity is another critical attribute of SHE that is relevant to this research. Most of the world's wicked problems are not disciplinary in nature (Moore, 2005); therefore, the interdisciplinary approach allows for methodological and knowledge

exchange, defying linear thinking to problem-solving and requiring openness and collaboration (Newell, 2011 as cited in Viegas et al., 2016). Transdisciplinarity can be defined as “a strong form of interdisciplinarity” (Hampson, 2012, p. 77 as cited in Viegas et al., 2016) and requires acceptance of non-academic knowledge (Pearson et al., 2005 as cited in Viegas et al., 2016). Transdisciplinary learning can ensure that students study concepts from more than one perspective, and engage students to comprehend and address complex social problems using more than one epistemological framework (Evans, 2015). However, within this research findings, transdisciplinarity is non-existent.

If the ultimate goal of learning is behavioural change (Mintz & Tal, 2013 as cited in Viegas et al., 2016), prerequisites of pro-environmental behaviour are: creation of knowledge about environmental challenges, increasing environmental literacy and developing pro-environmental values and beliefs (Viegas et al., 2016). Nevertheless, knowledge of sustainability challenges does not necessarily correspond with a change of behaviour (Breunig et al. 2014 as cited in Viegas et al., 2016) both on an individual and *organisational level*. Therefore, Cortese (2003) states that a sustainable future requires a paradigm shift toward a *systemic perspective*.

Sterling (2004) argues that a sustainability education paradigm:

- involves “a fundamental change of purpose of education” (p. 57);
- encourages “critical and reflective thinking, creativity, self-organisation, and adaptive management” over-prescriptive approach and particular outcomes (p. 58);
- Is based on systemic learning and holistic educational paradigm;
- “requires a deep-learning process by educational actors - policy-makers, managers, theorists, researchers and practitioners” (p. 58).

To facilitate transformation of universities towards sustainability education paradigm, there should be understanding of what sustainability initiatives have been effective by looking into success stories, but, more importantly, there should be a deeper understanding of characteristics of universities (Sharp, 2002).

2.1.2 Integrating sustainability in higher educational institutions (HEI)

The nature of universities

Integrating sustainability within higher education requires the involvement of the whole university as an organisation (Sterling, 2004). Cebrián et al. (2013, p. 286) understand this process as “involving: the social, cultural, economic and environmental dimensions of sustainability; and all the activities of a university including research, teaching and learning, engagement and campus estates and operations”. At the same time, embedding sustainability demands long-term planning and involvement of multiple stakeholders at all levels (Müller-Christ et al., 2014).

As mentioned above, the integration of sustainability on an institutional level requires an understanding of the nature of universities. The most significant characteristics of universities as an organisation is complexity (Sharp, 2002).

Referring to classic studies in organisational management by Simon and March (1958), Sharp (2002) argues that the universities are limited in the capacity to behave rationally due to being multi-structured complex organisations. Any effort for wide-scale transformation should consider existent of three subcultures within universities that have different decision-making practices, priorities and goals: students, faculty, and administration; and subsequent power tension between these subcultures

(Sharp, 2002). Therefore, organisational change in universities do not follow a rational strategy and can happen when people from each subculture set up their own priority to make the change happen and establish new structures (Sharp, 2002).

Cortese (2003) highlights that universities are organised into highly specialised disciplines, and higher education stresses individual learning and competition. Although, in recent years there has been significant progress in a number of interdisciplinary programmes and research groups.

As one of the world's oldest organisations, structures in higher education system may produce the same problematic behaviour despite cultural, geographic or economic differences. The patterns of behaviour of a system are called systems archetypes (Senge 2006)³. For example, Sharp (2002) points out that sustainability initiatives in HEIs often shift from envisioning large-scale systemic transformations to implementing smaller scale projects with less impact. This pattern could be traced in campus greening initiatives and curriculum change towards sustainability when short-term initiatives are often favoured over long-term systemic changes. Senge (2006) describes it as the system archetype 'Eroding goals', when the burden shifts towards short-time solutions, letting fundamental long-term goals to decline. This archetype is especially evident when organisations, including universities, set an ambitious goal for sustainability achievement, however, over the time the goal becomes less grandiose, losing the initial vision. While some organisations do it purposefully in the act of 'greenwashing',⁴ others indeed become victims of inter-organisational barriers that lead to degradation of a vision.

3. The detailed discussion of the concepts system archetypes and mental models follows in the next chapter.

4. Greenwashing refers to the practice of making misleading or deceptive claims about the environmental benefits of the product, service or company's practice. For example, if an organisation boasts about environmental and social policies, but those policies are not implemented in practice, it is an act of greenwashing.

University systems also have specific mental models - assumptions and generalisations ingrained in people's thinking and behaviour (Senge, 2006). Sharp (2002, p. 134) highlights some prominent mental assumptions:

- The Earth is infinite, and there is an "away" to throw away things. While the scientific community did reach the consensus that climate change is real, as mentioned above, knowledge about environmental challenges does not necessarily result in pro-environmental behaviour;
- The individual is powerless to effect change within the large and complex systems.

In the academic community, despite the increase of interdisciplinary research in recent years, there is a general approach to narrowing down the subject and studying a particular problem of a whole (Lidgren et al., 2006). Another common mindset is that experts should deliver knowledge - teachers know the subject better than anyone. Therefore, it is harder to accept non-academic knowledge and introduce new concepts (Lidgren et al., 2006).

Complexity, discipline-based structures, system archetypes and specific established mental models in a university environment (Sharp, 2002) must be understood to achieve sustainability in higher education. That being said, sustainability should be diversely integrated into university activities to provide future decision-makers - students with the skills and knowledge necessary for a more sustainable society (Lozano, 2010 as cited in Lozano & Lozano, 2014). Cortese (2003) argues that to integrate sustainability into higher educations, four areas of practice should be reflected in the educational experience of students:

- Education: curriculum changes to expand on sustainability themes
- Research: move beyond specialised disciplines to connecting knowledge to larger system interactions and human/ environment interdependencies);

- University Operations: the ecological and social footprint of the institution, including sustainability initiatives in the operation of university campus and community;
- External community: working to improve local and regional communities by engaging students in real-life problem-solving.

Next sections discuss barriers to sustainability in higher education summarised from a review of literature and opportunities that may exist or should be introduced in universities for the success of sustainability initiatives.

Organisational change in HEIs

As mentioned above, universities do not specifically support rational organisational decision-making strategy and for the large-scale change to happen all three subcultures within universities - students, faculty, and administration - should have aligned goals and a shared vision (Sharp, 2002). Universities face “supercomplexity in action” (Temple, 2010, p. 105) when aiming to bring organisational changes, including sustainability initiatives. Barnett (2000) developed the term supercomplexity and defines it as “outcome of a multiplicity of frameworks” (p. 415). He characterises the world of supercomplexity in four concepts: contestability, challengeability, uncertainty and unpredictability (Barnett 2000), and refers to the need of universities “to abandon its inbuilt sense of ‘knowing’” (Barnett 2000, p. 420).

Senge (2006) stresses out the importance of developing individual actors⁵ to facilitate transformation and learning on an organisational level. University leaders must overcome many organisational barriers (Ferrer-Balas et al., 2010), hidden contradictions and tensions (Hoover & Harder, 2015), and recognise existing opportunities. Successful integration of sustainability into university operation may require changing how people within this established subcultures think, behave and interact; therefore, the resistance against changes can be substantial (Lidgren et al., 2006).

5. Senge names the concept as personal mastery - “the discipline of continually clarifying and deepening our personal vision, of focusing our energies, of developing patience, and of seeing reality objectively” (Senge, 2006, p. 22). It is part of five characteristics of a learning organisation: Systems Thinking, Personal Mastery, Mental Models, Shared Vision and Team Learning.

Barriers to sustainability in HEIs

Several authors describe recruiting barriers, and some of them were evident in this research outcome too. I classified common barriers from literature review in Table (1).

Table (1) Common barriers to integration of sustainability initiatives in HEIs identified from the literature review.

| Category | Sub-category | Description in Literature Review |
|--|---|---|
| The nature of Universities (Sharp, 2002) | <i>Discipline-based</i> | <ul style="list-style-type: none"> • Specialised disciplines and fragmented knowledge (Cortese, 2003) • The disciplinary environment: the system produces 'excessively specialized' experts (Moore, 2005a) • Specialised disciplines when sustainability issues span over many disciplines (Lidgren et al., 2006) • Lack of interdisciplinary research (Velazquez, Munguia, & Sanchez, 2005) |
| | <i>A culture of rationality and criticism</i> | <ul style="list-style-type: none"> • Research and knowledge development through being criticised by other researchers, which can lead to being uncertain about new ideas (Lidgren et al., 2006) • The myth of rational university and that there is little space for improvement (Sharp, 2002) (Lidgren et al., 2006) • Rational and pragmatic university cultures and rigid roles (Hoover & Harder, 2015) |
| | <i>Competition</i> | <ul style="list-style-type: none"> • Competitive environments (Moore, 2005a) • Stressing individual learning and competition (Cortese, 2003) • Territories, conflict and enhancing competition (Hoover and Harder, 2016) |
| Individual worldview and lack of awareness | <i>Staff awareness and motivation</i> | <ul style="list-style-type: none"> • Lack of awareness, interest, and involvement (Velazquez et al., 2005) • Ignorance or lack of awareness upon the relevance of sustainable development (Lozano & Lozano, 2014) • Lack of motivation amongst staff concerning sustainability (Lozano & Lozano, 2014) |
| | <i>Denial and resistance</i> | <ul style="list-style-type: none"> • Individual worldview about sustainability - denial (Hoover & Harder, 2015) • Resistance to change (Velazquez et al., 2005) • Teachers who might prevent or support sustainability initiatives due to established routines (Lozano & Lozano, 2014) |

Table (1) (continued).

| Category | Sub-category | Description in Literature Review |
|------------------------------|--|---|
| Monitoring and reward system | <i>Lack of commitment to sustainability policy</i> | <ul style="list-style-type: none"> • Lack of standard definitions of concepts (Velazquez et al., 2005) • Despite signing them, not implementing declarations for environmental sustainability in higher education (Wright, 2002) • Misdirected criteria for evaluation (Moore, 2005a) • Lack of policies to promote sustainability on campus (Velazquez et al., 2005) |
| | <i>Evaluation indicators</i> | <ul style="list-style-type: none"> • No clear indicators to monitor progress on sustainability initiatives - Lund University case study (Lidgren et al., 2006) |
| | <i>Rewarding</i> | <ul style="list-style-type: none"> • No rewards for successfully integrating sustainability or/ and no penalties for failing to do so (Lidgren et al., 2006) • Lack of incentives for innovative teaching (Moore, 2005b) • Rewards and support for only specific individuals, sustainability champions (Hoover & Harder, 2015) |
| Organisation | <i>Power and organisational culture</i> | <ul style="list-style-type: none"> • Organizational structure (Velazquez et al., 2005) • Organizational culture (Hoover & Harder, 2015) • Unclear priority-setting and decision-making: pointing power (Moore, 2005a) • Pointing power (Hoover & Harder, 2015) • Actors assume that sustainability is not their concern (Sterling, 2004). • Lack of support from university administrators (Velazquez et al., 2005) • Lack of proper settings and support to effect change (Lozano & Lozano, 2014) |
| | <i>Lack of resources (funds, time, information flow)</i> | <ul style="list-style-type: none"> • Organizational barriers, such as lack of financing, time and low interest in community outreach activities (Ferrer-Balas, 2010) • Lack of funding (Velazquez et al., 2005) • Profits mentality (Velazquez et al., 2005) • HEIs being over-managed and operating more like businesses (Moore, 2005a) • Lack of time (Velazquez et al., 2005) • Over-crowded curricula (Lozano & Lozano, 2014) • Lack of data access (Velazquez et al., 2005) • Lack of training (Velazquez et al., 2005) • Lack of opportune communication, and information (Velazquez et al., 2005) • Technical problems (Velazquez et al., 2005) • Lack of designated workplace (Velazquez et al., 2005) |

Opportunities to sustainability in HEIs

There are also factors and conditions that already exist within universities or should be implemented for the successful integration of sustainability initiatives.

Table (2) Factors and conditions for the successful integration of sustainability initiatives identified from the literature review.

| Category | Sub-category | Description in Literature Review |
|-------------------------------|--|--|
| Universities as organisations | <i>Systemic approach and organisation learning</i> | <ul style="list-style-type: none"> • Holistic understanding of systems in the contemporary world (Sterling, 2004) • Turn into a learning organisation by practising sustainability in education, research, community outreach and management of campus facilities (Ferrer-Balas et al., 2010, p. 608) • Openness to new ideas (Hoover & Harder, 2015), participation, cooperation and dialogue (Müller-Christ et al., 2014) • Integration of planning, decision-making and evaluation (Moore, 2005b) • Pressure by external stakeholders such as government, the labour market and international agencies (Müller-Christ et al., 2014). |
| | <i>Collaboration and dialogue</i> | <ul style="list-style-type: none"> • Collaboration and cooperation (Cortese, 2003)(Moore, 2005b), especially between key people to successfully implement sustainability initiatives in universities (Velazquez et al., 2006) • Dialogues, including face-to-face interaction (Sharp, 2002) between individuals to bridge internal boundaries (Hoover & Harder, 2015) • Active listening skills (Sharp, 2002) • Promote participatory decision-making processes (Temple, 2010) using bottom-up and top-down approaches (Cebrián et al., 2013) |
| | <i>Infuse sustainability in all decision</i> | <ul style="list-style-type: none"> • Sustainability across and beyond boundaries (Hoover & Harder, 2015) by making it a top priority (Lidgren et al., 2006) and including sustainability-related goals in the strategic plan, entering a network of like-minded organisations, • Relate sustainability in curricula to students (Lidgren et al., 2006) • Provide people with the directions, motivations and abilities to continue sustainability initiatives (Lidgren et al., 2006) • Start with the ideas that attract the least resistance to build a foundation for more challenging transformations (Lidgren et al., 2006) |

Table (2) (continued).

| Category | Sub-category | Description in Literature Review |
|-------------------|---|---|
| | Individual commitment | <ul style="list-style-type: none"> • Focus on personal and social sustainability (Moore, 2005b) • Individual worldview about sustainability (Hoover & Harder, 2015), specifically, support of decision-making people in the institution (Müller-Christ et al., 2014). • Importance of committed individuals and champions (Cebrián et al., 2013), but develop institution-wide efforts for collective actions (Hoover & Harder, 2015) • Flexible and human centred structures (Hoover & Harder, 2015) • A deep learning process by educational actors (Sterling, 2004) and training for managers to increase leadership competencies on sustainability (Cebrián et al., 2013) |
| Campus operations | Campus engagement | <ul style="list-style-type: none"> • The idea of the 'good-living campus' and the philosophy of "hands-on practice" (Müller-Christ et al., 2014, p. 135) • Engage all members of the university, especially senior administration (Müller-Christ et al., 2014, p. 135) • Open communication between stakeholders both on and off campus (Müller-Christ et al., 2014) • Stimulate innovative potential by turning the campus into a testing field (Müller-Christ et al., 2014) |
| | Sustainability declaration, policies, monitoring and indicators | <ul style="list-style-type: none"> • Link university accountability for societal development with campus sustainability. Internal drivers such as sustainability declaration, the mission statement and sustainability guidelines may allow the university to specify sustainability goals and the integration process (Müller-Christ et al., 2014). • Take a micro-approach to sustainability higher education by creating institutional environmental sustainability policies that are meaningful for their particular situation (Wright, 2002, pp. 111-112) • Develop and utilise new indicators that showcase if the students have the knowledge of sustainability issues (Lidgren et al., 2006) • Implement effective assessment and reporting systems to track their progress in incorporating sustainability (Ferrer-Balas et al., 2010, p. 608) |

Table (2) (continued).

| Category | Sub-category | Description in Literature Review |
|--|--------------|---|
| Engagement, community outreach, and partnerships | | <ul style="list-style-type: none"> Forming partnerships with local and regional communities (Cortese, 2003) for potential mutual learning for sustainability (Ferrer-Balas et al., 2010). Utilise stakeholder and society-wide dialogue by actively engaging with internal and external stakeholders regarding the university's sustainability goals (Lidgren et al., 2006) (Müller-Christ et al., 2014). Turn universities into 'meeting places' open to interactions with both the greater scientific community and society at large, including local, regional and national stakeholders (Müller-Christ et al., 2014, p. 136) Engage students in the real world. Learners must also experience interdisciplinary perspectives and learn to take into account different levels of scale, from local to global (Müller-Christ et al., 2014, p. 136) Student partnerships - tapping into talented, committed students and involving with positions that are relevant and integrated into university systems (Sharp, 2002) Encourage intra-university learning by building on multidisciplinary competence and knowledge exchange (Lidgren et al., 2006). |
| Curriculum | | <ul style="list-style-type: none"> Emphasise active, experiential, inquiry-based learning and real-world problem solving (Cortese, 2003) Collaborative and transformative learning (Moore, 2005a) Participatory evaluation (Moore, 2005a) Identify and recognise topics that contribute to sustainability in the existing educational curricula (Lidgren et al., 2006). Offer additional courses on sustainable development, which can start as electives (Müller-Christ et al., 2014) Look for windows of opportunity: processes of fundamental restructuring the university system. For example, joining Bologna process brought the number of structural changes in curriculum (Müller-Christ et al., 2014, p. 136) Incentives for professional development and create space for pedagogical transformation (Moore, 2005b). The success of sustainability initiatives depends on the capability and willingness of staff to follow with the challenge. Capacity building includes training opportunities for existing lecturers (including allocating time for training) and bringing additional teaching staff (Müller-Christ et al., 2014). |

Besides understanding of the characteristics of universities as organisations, Sharp (2002) recommends looking into success stories of sustainability initiatives in universities. Below I review two case studies from Lund University and the University of British Columbia and Sustainable University Model, which are not specifically success stories, but I found them especially useful for this research purposes in terms of methodology and analysis.

Examples from the literature review on the integration of sustainability in HEIs

Lund University

The case study from Lund University (LU) by Lidgren et al. (2006) aims to identify barriers to including sustainability-related content in the university curricula and to develop solutions to overcome these barriers. They described LU based on Meadows' (1999) leverage points and used them as a tool to systematically discover barriers to curricula changes and address those barriers through

recommendations for intervention (Box 1). This research also uses a systems approach and takes the case study from LU as an example.

University of British Columbia

Another relevant case study was conducted at the University of British Columbia (UBC). Moore (2005a and 2005b) conducted semi-structured interviews with 30 participants including undergraduate students, staff, faculty members from a range of disciplines, Deans, Associate Vice-Presidents and Vice-Presidents. Some of them were actively working on sustainability issues, while others not. The research questions included the following: "What are the barriers and limitations for creating sustainability education? What are the major institutional structures and dynamics that aid in (or obstruct) the development of sustainability education at UBC in the area of undergraduate education in the arts and sciences?" (Moore, 2005a, p. 541). The case study was useful to clarify research questions and methods during empirical research. Table (3) includes barriers to sustainability education at UBC developed as a result of interviews by Moore (2005a).

Box (1) The recommendations developed Lidgren et al. (2006, p. 805) using system perspective to discover barriers to curricular changes.

| Leverage point by Meadows (1999) in increasing order of effectiveness | Places where the recommendations are designed to intervene in the system. |
|--|---|
| 6. The structure of information flows (who does and does not have access to information). | Develop and utilise new indicators |
| 5. The rules of the system (such as incentives, punishments, constraints). | Encourage intra-university learning |
| 4. The power to add, change, evolve, or self-organise system structure. | Strengthen student involvement Utilise stakeholder dialogue |
| 3. The goals of the system. | Make sustainability a top priority |
| 2. The mindset or paradigm out of which the system – its goals, structure, rules, delays, parameters – arises. | Clarify the required paradigm shifts |

Table (3) Barriers to sustainability education at UBC developed by Moore (2005a, p. 543)

| | |
|---|--|
| <i>The disciplinary environment</i> | <ul style="list-style-type: none"> • Disciplines determine organisational structure and most departments claim interdisciplinary programs. • Funding is allocated to departments - infrastructure/ structures determine outcomes. • Turf wars and boundary wars due to contentious worldviews. • Students have difficulty changing directions, taking courses outside their discipline (i.e. too many prerequisites) |
| <i>Competitive environments</i> | <ul style="list-style-type: none"> • Between and within: students (for grades), faculty (publication, grants), departments (students, funding), universities (prestige, power, etc.). |
| <i>Misdirected criteria for evaluation</i> | <ul style="list-style-type: none"> • Faculty (publication lists for promotion and hiring) • Student exit surveys focus on jobs and salaries as criteria for student evaluation. • Lack of clear evaluative structures for university policy and plans (i.e. lack of policy implementation). |
| <i>Unclear priority-setting and decision-making</i> | <ul style="list-style-type: none"> • Too many priorities. • Unclear decision-making structures. Research as a top priority. • Distinct hierarchy of power—administration, faculty, staff and students. |

Sustainability University Model

Velazquez et al. (2006) collected empirical data from 80 higher education institutions around the world to propose Sustainability University Model (Figure 2), which I found useful as it visually comprehends many aspects of sustainability education mentioned above. The model consists of four implementation phases from strategic to operational actions (Velazquez et al., 2006, pp. 812-815):

- *Phase one:* developing a sustainability vision for the university. At this stage, universities should define their concept and definition of what is a sustainable university.
- *Phase two:* Create the university mission statement to include sustainability as one of the core values of their university.
- *Phase three:* Sustainability committee: creating policies, targets, and objective. Reflect university's commitment by integrating

sustainability-related policies into campus-wide policies, objectives, and targets through the establishment of a sustainability committee.

- *Phase four:* sustainability strategies. Echoing Cortese (2003), Velazquez et al. (2006) suggest that all sustainability initiatives of universities should be organised into four strategies: education; research; outreach and partnership; implementing sustainability on campus.

However, the implementation cannot be adequately completed without monitoring, analysing, and controlling the performance of sustainability initiatives, as well as continuous improvement. Therefore, the model also employs PLAN - DO - CHECK - ACT continuous iteration process to “seeks improvements as a never-ending process of achieving small improvements” (Chase & Aquilano, 2001 as cited in Velazquez et al., 2006, p. 817).

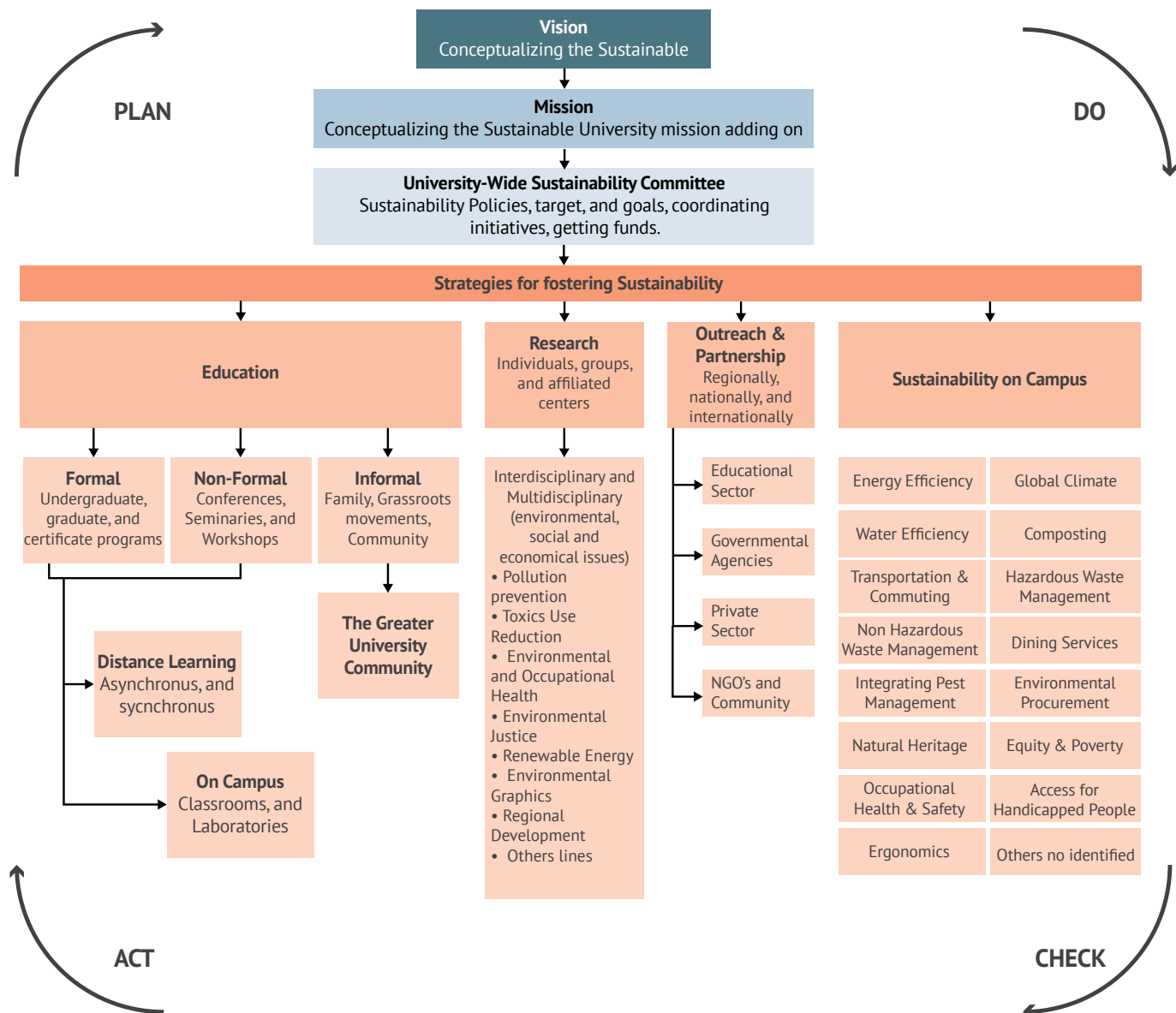


Figure (2) Sustainable university model proposed by Velazquez et al. (2006, p. 814) - redrawn.

It is worth mentioning that Cebrián et al. (2013) note that many such theoretical models have not been applied and there is no demonstration of their outcome. Nevertheless, the Sustainable university model provides guidance for integrating sustainability in higher educational institutions.

The next sub-chapter diverts from a broader topic of sustainability in universities towards sustainability in architectural-design education to connect research on SHE with KazGASA.

2.1.3 Sustainability in architectural-design education

This case study research focuses on a specific higher educational institution - KazGASA, a leading architectural-design school in Kazakhstan. Architectural schools face the same organisational issues as any university, but there are some variations in curricula and teaching methods. Just like sustainability education, contemporary architectural-design education is quite complex. There are many knowledge and skills that young designers entering into the field should acquire - fundamental principles of design, visual literacy, history of design, specialised 2D or 3D software (Adobe Creative Suite, CAD or BIM software), user centred design, ergonomics, and interpersonal skills like teamwork and communication. In the end, depending on educators and teaching methods, sustainability may take backstage as an additional “good to consider” factor, instead of being at the core of the educational experience.

There is a critical and immediate need to shift thinking on how the built environment is designed because energy use of buildings and construction process represent more than one-third of global energy consumption and contribute to nearly one-quarter of greenhouse gas emissions (GABC, n.d.).

Although, awareness and interest in the themes of sustainability are growing worldwide, there is an assumption among architectural professionals that clients’ demands are often driven by aesthetic appearance and cost reduction rather than by a commitment to sustainability (Altomonte, Rutherford, & Wilson, 2012). Other barriers to integrating sustainability within the architectural practice are (Altomonte et al., 2012, p. 146):

- Lack of a legislative framework and need for clearer standards;
- Lack of a long-term vision and financial incentives to promote innovation in design;
- Lack of multidisciplinary and knowledge transfer between built environment professionals;
- The mental model of considering sustainability factors as complex, expensive and lying within the domain of the specialist;
- Misleading claims and conflicting information on performance (e.g. ‘greenwash’);
- Misconceptions on costs and mindsets that prioritise saving money at the time of investment rather than looking at costs of ownership.

Overall, architects often focus on a solution rather than problem in the development of design (Rutherford & Wilson, 2006 as cited in Altomonte, 2009), which is derived from a studio environment when architectural students “receive a criticism which is mostly focused on the solution they put forward rather than the methodology they apply” to analyse a specific problem (Altomonte, 2009, p. 16).

Altomonte (2009) points out that the currently the respond to demands of enhancing sustainable environmental design within the creative architectural practice is slow and architectural schools have been “relatively ineffective in methodically integrating sustainable environmental design” (p. 12) in the educational experience of

students. Architectural educators face a difficult situation of incorporating important and complex sustainability topics within a busy curriculum. In addition, many architectural schools still divide theoretical and applied teachings (EDUCATE, 2010a as cited in Altomonte et al., 2012). Fundamental principles and concepts are introduced during the lectures, but architectural studio projects do not properly reflect or request integration of theoretical knowledge (Altomonte et al., 2012). However, it is critical to “develop pedagogies that combine both technical and holistic issues of sustainability with a design approach that is inventive, creative and responsive to pressing environmental needs” (Altomonte et al., 2012, p. 144).

Muratovski (2016) states that as the design industry change, traditional education systems are becoming less capable of supplying industry with people who have an appropriate and useful mix of skills and experience. The reform of design education should be prioritised to discuss professional responsibility, the purpose of design and development of individualistic ethics; and environmental issues and socio-cultural challenges could be an adequate purpose for the coming generation of designers (Findeli, 2001).

Design students require more empathic engagement with their work and first-hand experience with the real-world's social, cultural, economic, environmental and political challenges (Design Accord, 2011).

According to Second Nature (Glyphis, 2001, p. 3), “transforming architecture education means focusing on how to teach as well as what is being taught”. Their recommendations including transforming the curriculum, studio teaching, supporting student leadership, and integrating students and faculty into the planning of campus facilities (Glyphis, 2001).

Integration sustainability into the architecture curriculum

Citing other authors, Lozano & Lozano (2014) identify four approaches for incorporating sustainable development into higher education curricula:

- Some topics related to sustainability within the existing module or course;
- A specific course on sustainable development;
- Sustainability topics included in regular disciplinary courses
- Sustainable development as a specialised programme within each faculty.

Wright (2003) describes three approaches to introducing sustainable design into the architecture curriculum, which echo approaches mentioned in the previous section:

- The assumption that sustainability is integral to the curriculum. It is based on the belief that pro-environmental and socially inclusive factors are fundamental to the good design, implying that they are already part of architectural education and there is no need to address them outside of standard theory and studio courses. However, Wright (2003) points out that the approach assumes that faculty members would include sustainability topics in the course on one's own account.
- Expansion of existing courses concerning environmental systems, which are often technical courses teaching aspects of the built environment such as climate control (HVAC), occupational safety and comfort, energy efficiency, and so on. They may be taught by faculty members specialising in technical knowledge, placing more emphasis on the technical aspects of sustainable design rather than integrating it fully into the design studio and theory courses (Wright, 2003). In addition, “a highly reductionist pedagogy that concentrates exclusively on energy use and resource conservation” (Altomonte et al., 2012, p. 144) excludes important, but less tangible issues such as sociocultural, economic, political, or other environment-related challenges of the built environment.

- The revision of the entire curriculum to fully integrate the subject. The third approach is the most viable approach from the systems perspectives and includes entire faculty. However, Wright (2003) points out that it requires effective leadership and favourable outside factors.

Lulo, Gorby, Poerschke, Kalisperis, & Woollen (2013) compare curricular approaches of six architectural schools in the US that are considered to be national leaders in sustainability education. They conducted a thorough literature search and organised in-person symposium, the result of which is “model curriculum in which environmentally conscious design content becomes a continuous thread that connects all year levels of a program” (Lulo et al., 2013, p. 444). The model (see Table 4) is noteworthy for this research because it is specific to undergraduate architectural education and based on a 5-year study programme.

Other recommendations to integrate sustainability into architectural education are:

- Knowledge construction “through active engagement, participation, and collaboration between learners and educators” (Datta, 2007 as cited in Altomonte, 2009, p. 16);
- Learning outcomes should be part of the comprehensive result of integrated curriculum instead of being separately defined for each course or module (Altomonte et al., 2012);
- Opportunities for students to participate in collaborative design studios and related classes (Lulo et al., 2013);
- Need for a culturally based approach to environmental design education in addition to technical courses (Lulo et al., 2013).
- Understanding a building as a part of a larger system - local and regional environment, construction and infrastructure system, material flow - and their impact on cultural, social, economic, political and environmental contexts. It requires comprehension of complexity and holistic thinking (Lulo et al., 2013).

The research returns to the literature review in Chapter 5 Discussion (p. 68) connecting the most relevant concepts within the three themes with the research findings.

The next sub-chapter moves away from literature review to introduce the reader to the secondary research on the education system in Kazakhstan, including government strategies.

Table (4) A model for environmentally conscious content developed by lulo et al. (2013, p. 444-445).

| Year | Curriculum |
|---|---|
| <i>Year 1: the individual and the environment</i> | <p>Introduction to science, history and ethics of climate change and emerging sustainability paradigm</p> <ul style="list-style-type: none"> • Understanding natural processes: in nature, there is no waste (circular systems not linear). • Understanding people: consider the wide range of cultures, races, religions and habits of the people inhabiting the built environment. |
| <i>Year 2: environmentally responsible site-building interaction (site, material, and construction)</i> | <p>Introduction of basic environmental planning strategies in architectural design by evaluating the site, the embodied energy of materials, and the energy efficiency of design, materials and construction techniques:</p> <ul style="list-style-type: none"> • Understanding environmental impact. • Understanding the nuances of place. • Connecting with nature |
| <i>Year 3: the building as an environmentally conscious system</i> | <p>Consolidation of environmental planning strategies and sustainable concepts in architectural design by integrating energy responsible technical systems (daylighting, insulation, natural ventilation, mechanical systems, and others):</p> <ul style="list-style-type: none"> • Embracing co-creative design processes: understanding that design is a collaborative effort between clients, systems consultants, engineers and other experts; and understanding that environmentally conscious design happens early in the design process. • Introduction to sustainable design strategies. • Approaches to environmental strategies in different cultures. |
| <i>Year 4: the interrelationships between the building and urban environment</i> | <p>Exploration of the synthesis of individual buildings, groups of buildings, service systems and the urban realm to understand the inter-relationships between the physical conditions and individual needs (social and cultural conditions) in the urban environment.</p> |
| <i>Year 5: comprehensive, environmentally conscious design</i> | <p>Exploration of the expressive and theoretical potential of environmentally conscious design.</p> <ul style="list-style-type: none"> • Integration of complex aesthetic, ethical and technical aspects of sustainability/ resilience in all scales from detail to the city in the thesis projects. |

2.2 Education System in Kazakhstan

Education is UNESCO's top priority. It is considered a fundamental human right (UNESCO, 2017) and as an essential factor to achieve UN 17 Sustainable Development Goals (Figure 1, p. 9) (UN, 2015). In 2015 together with other world leaders President of Kazakhstan Nursultan Nazarbayev signed the UN 2030 Agenda to support the implementation of SDGs in the country. For Kazakhstan, it has also provided an opportunity to adopt the strategic planning and monitoring system in the country to world standards (e.gov, 2017).

Moreover, in 2012, President Nazarbayev announced the new Kazakhstan 2050 Strategy (Strategy 2050, n.d.). Coupled with UN 2030 Agenda, the goal is bringing into action the interrelationship between government strategic programs and international commitments (Statistics Committee, 2016).

Kazakhstan 2050 Strategy and obligations in front of international community brought significant changes to the country's education sector including the joining of Bologna process and adoption of the strategic plan for 2017-2021 by the Ministry of Education and Science.

2.2.1 Government policies

Strategy 2050

Strategy 2050 is a comprehensive state plan to bring widespread economic, social and political reforms to position Kazakhstan among the thirty most developed countries in the world by 2050. Key pillars of the strategy are strengthening institutions, improving physical infrastructure, and raising the quality of human capital (Strategy 2050, n.d.).

Sustainability challenges are not mentioned directly in the original strategy document from 2013. However, the strategy emphasises sustainable economic growth and increasing social standards of living, including preventing poverty, protection of mothers and children, and improving health care system.

Box (2) The major directions defined in the Strategy 2050 by President Nazarbayev (Strategy 2050, n.d.)

1. The economic policy of the new course – all round economic pragmatism based on the principles of profitability, return on investment and competitiveness.
2. Comprehensive support for entrepreneurship – a leading force in the national economy.
3. New principles of social policy – social guarantees and personal responsibility.
4. Knowledge and professional skills are key landmarks of the modern education, training and retraining system.
5. Further strengthening of the statehood and development of Kazakhstan's democracy.
6. Consistent and predictable foreign policy is the promotion of national interests and the strengthening of regional and global security.
7. New Kazakhstan patriotism is the basis for the success of our multi-ethnic and multi-confessional society.

The economic policy (see Box 2) contains the new system of managing natural resources with the need to develop the production of alternative energy sources and introduce solar and wind power technologies so that by 2050 alternative and renewable energy sources could provide at least a half of country's total energy consumption (Strategy 2050, n.d.). In 2017, Kazakhstan held Expo 2017 under the theme "Future Energy", and in the strategy, it is considered as an essential kick-off for the energy-related technological transfer.

In terms of higher education, the priority is to develop the technical (engineering) education according to international standards. Also, higher education institutions should not only focus on the improvement of curricula and teaching but

I. Important disruptive changes



II. Evolutionary road: priority policies for implementation of Strategy 2050

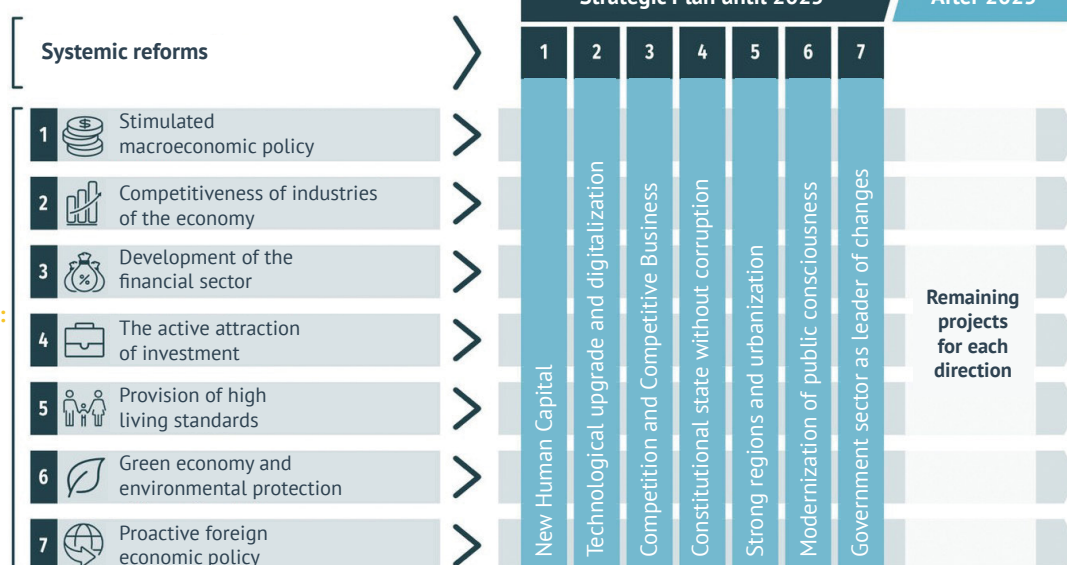


Figure (3) Strategy 2050 and Strategic Plan 2025.

Translated from the official website of the Prime-Minister of Kazakhstan (2018).

develop research activities. The overall education system is expected to 1) develop a system of social responsibility in education by creating a network of public-private partnerships and expand scholarship schemes; and 2) modernise teaching methods by employing online learning, removing outdated disciplines, including more practical skills, and orienting curricula towards entrepreneurship (Strategy 2050, n.d.).

Despite aiming to cover broad strategic goals, the main Strategy 2050 document stays quite vague about concrete details. Consequently, additional sub-strategies support the strategy. For example, after the country achieved the fundamental goals of the strategic development plan until 2020, the new Strategic plan until 2025 replaced it (The Prime-Minister of Kazakhstan official website, 2018).

Strategic development plan until 2025

Approved at the beginning of 2018, after UN 2030 Agenda, the Strategic development plan until 2025 is more reflective of SDGs. It specifically mentions that the goal is to achieve a qualitative and sustainable economic growth leading to increase of national well-being using UN Sustainable Development Goals as an important reference points (The Prime-Minister of Kazakhstan official website, 2018). There are seven

systemic reforms for advanced development and seven priority policies (Figure 3).

It is worth mentioning that due to the novelty of the Strategic Plan until 2025, it is hard to understand its realisation beyond deliberation on the government level.

2.2.2 Education in Kazakhstan

Education system facts

The government develops and ensures the implementation of the state policy on education. The Ministry of Education and Science (MES) implements a unified state policy, provides coordination and methodological guidance to educational institutions, and manages the application of international standards in the field of education and science (EACEA, 2017). Primary and lower secondary school (grade 1 to 9) are free in Kazakhstan, and it is constitutionally-protected right. After grade 9, children can either continue free secondary school (grade 11) and pass the Unified National Test (UNT) upon completion or go to vocational training.

Higher education institutions can be public state-owned or private, but all are regulated

and monitored by the MES. The MES establishes standards for the admission of students in higher education. The admission process and allocation of government-funded scholarship are carried out based on the results UNT and distributed by the MES among all eligible HEIs (EACEA, 2017).

Higher education institutions have a certain freedom in the decision-making process, but the degree of centralisation is still high. HEI in Kazakhstan (EACEA, 2017, pp. 3-4):

- are free to take decisions in the organisation of the educational process, the selection and the appointment of teaching and administrative staff, and the implementation of scientific, financial and economic activities within the framework defined by the law.
- have the right to establish direct links with national and international partners to make agreements on cooperation in various fields.
- set their own structure, the number and order of admissions of fee-paying students within the related standard rules of admissions to universities.

but

- do not have full autonomy regarding curriculum and admissions.
- must meet the MES standards related to the content of educational programmes, admission exams, completion of studies, the awarding procedures of academic degrees and quality assurance.
- must pass national and international accreditation schemes to be eligible for government funding.

Bologna Declaration

Since 1991 when Kazakhstan gained independence following the collapse of the Soviet Union, there have been significant structural changes in the country's education system. In 2010, Kazakhstan

signed the Bologna Declaration, and, following these changes, the structure and the study programmes in higher education were revised to meet the requirement of European Higher Education Area (EHEA) (EACEA, 2017).

After joining the Bologna Declaration, the MES established the National Register of quality assurance agencies, which consists of ten national and international agencies. Also, the ECTS (European Credit Transfer System) was introduced, which led to increased funding for academic mobility and improvement of partnerships between national HEIs and international academic community (IQAA, n.d.).

Academic Freedom

In 2018, the government of Kazakhstan approved the first draft bill about giving HEIs academic freedom, especially, to institutions that passed international accreditation. The proposal gives HEIs a right to define the content of study programmes independently to increase the quality of education. As mentioned above, in the current system the MES establishes standards that limit control of curriculum by HEIs. In addition, currently, study programmes in the country are defined based on the National Occupational Classification. Many listed occupations are no longer relevant and a substantial amount of time is required to update the list on a national level. Therefore, with the new draft bill, HEIs will be able to develop new study programmes according to market requirements (Davydova, 2018).

The MES strategic plan for 2017-2021⁶

According to the strategic plan document, the main changes that happened in the higher education system in Kazakhstan are:

- Increasing partnership and exchange with foreign universities and research organisations

6. It is worth noting that there are several educational policies, including "The Republic of Kazakhstan state programme on developing education sector for 2011-2020". It is hard to understand which policy is being implemented as there is no clear indication on the MES website.

Box (3) The mission of the MES strategic plan for 2017–2021 is (The MES, 2016, p. 1):

Mission: the formation and implementation of state policy in the field of education and science, youth, ensuring the protection of the rights and interests of children, educating the younger generation in the spirit of the nationwide idea of “Mangilik El”, ensuring sufficient development of the intellectual potential of the nation to enter the 30 most developed countries.

Vision: An advanced education and science system, effectively functioning as the main driver of the development of the Kazakhstani economy and integrated into the world scientific and educational space, contributing to the development of a sense of pride of every citizen of the republic for their country.

- Developing study programmes on English and preparing academic staff teaching in three languages (Kazakh, Russian, English)
- Implementing and improving the system of monitoring and quality assurance of education
- Strengthening integration of education, science and businesses.

Nevertheless, the education system faces important barriers such as:

- Graduates do not always meet the requirements of employees as HEIs do not give students market required skills. The interaction between the labour market and education is weak.
- Lack of study programmes on English (or trilingual programmes on Kazakh, Russian, English)
- Low level of material, technical, laboratory and scientific base.
- The outflow of youth to foreign universities (which subsequently can lead to “brain drain”, significant emigration of educated individuals from the country).

Future development directions are:

1. Providing quality training and education to increase market competitiveness of graduates
 - Includes consideration of regional labour market requirements; improve employability in economically challenging regions of the country; providing barrier-free education for all; and further cooperation with international partners.
2. Modernisation of the content of higher and postgraduate education in the context of global trends.

- Increase choices of study programmes and elective courses; improve teacher education, including English language skills; increase the number of courses taught in English; continue improving academic mobility, and increase the role of the supervisory committee to monitor the quality of HEIs.

3. Improving management and monitoring the development of higher and postgraduate education
 - Training courses for HEIs administration; academic and administrative freedom to HEIs; continue improving organisation management of HEIs, including yearly corporate responsibility reporting and information training regarding a new organisational-legal structure of HEIs.
4. Development of infrastructure of higher education institutions
 - Create innovation parks, business incubators in HEIs; develop a mechanism to commercialise research within HEIs; and implementation of a World Bank project to modernise the content of pedagogical education.

It is safe to claim that there have major systemic changes in the education of the country, and the process is still ongoing. The MES strategic plan for 2017–2021 emphasises the importance of improving the quality of education and upgrading the organisational structure of HEIs to meet international market demands and increase the competitiveness of university graduates on the local and international level. However, considering the ambitious goal of joining 30 most developed countries in the world, there is a lack of attention towards climate change education and moral responsibility of HEIs to incite change towards sustainable development.

2.3 KazGASA

2.3.1 KazGASA mission

The academy's mission according to their website (KazGASA, n.d.):

The mission of KazGASA is to provide the preparation of highly-qualified specialists, to give the opportunity to students to get an education of all levels, to prepare highly intellectual broad-minded personalities who can find their places in the society and a rapidly changing world. KazGASA is aiming to give to its students not only good knowledge but also to grow feelings of civic responsibility, patriotism and internationalism.

This corresponds to the governmental policy of stability and mutual understanding between people of all nationalities, cultures and confessions.

One of the targets of the educational policy of the Academy is growing up in students understanding of principles of social and natural development, the establishment of personal characteristics such as honesty, decency, and respect to seniors, goodwill and sociability.

2.3.2 The structure of KazGASA

It is a privately owned institution, part of larger International Educational Corporation (IEC). KazGASA has five main faculties (Figure 4):

- Faculty of Architecture
- Faculty of Design
- Faculty of General Construction (Civil Engineering)
- Faculty of General Educational Disciplines
- Faculty of Construction Technologies, Infrastructure and Management

Accreditation

KazGASA is the republic leader in the fields of architecture and design in Kazakhstan and ranked first by IAAR (Independent Agency for Accreditation and Rating in Kazakhstan). KazGASA is a crucial actor defining the methodological and curriculum development of all architectural schools in the country.

Besides national accreditation, undergraduate Architecture programme in KazGASA passed through international accreditation of UNESCO UIA (International Union of Architects) in 2007 and again in 2011 (KazGASA, n.d.).

However, UNESCO UIA accreditation conditions are limited to the curriculum without mentioning campus operation (see Box 4).

KazGASA is part of Educational and Methodological Association (EMA) in the field of Architectural-Construction and Design profiles. There are 38 universities in the EMA, and 9 of the offer study programme in "Architecture".

KazGASA heads the methodological union of architectural schools within EMA and releases architectural study materials. Coupled with its position as the leading HEI in the field of architecture, the academy has a significant influence on the study programme of other architectural schools in the country. Consequently, the academy affects the entire architectural industry in Kazakhstan.

Box (4) UNESCO International Union of Architects (UIA, 2017)

International Union of Architects is an international non-governmental organisation and the only architectural union recognised by UNESCO.

The UIA Education Commission sets opinions related to education and recommendations for architectural education policy, proposing guidelines, documents, proposal. There is UNESCO-UIA Charter on Architectural Education (last updated in 2017) that sets the objectives and Conditions and Requirements for an

accredited school. Among the objectives, there are following capabilities (UIA, 2017):

- Design
- Knowledge
 - Cultural and artistic studies
 - Social studies
 - Environmental studies (that includes issues of ecological sustainability)
 - Technical studies
 - Design studies
 - Professional studies
- Skills

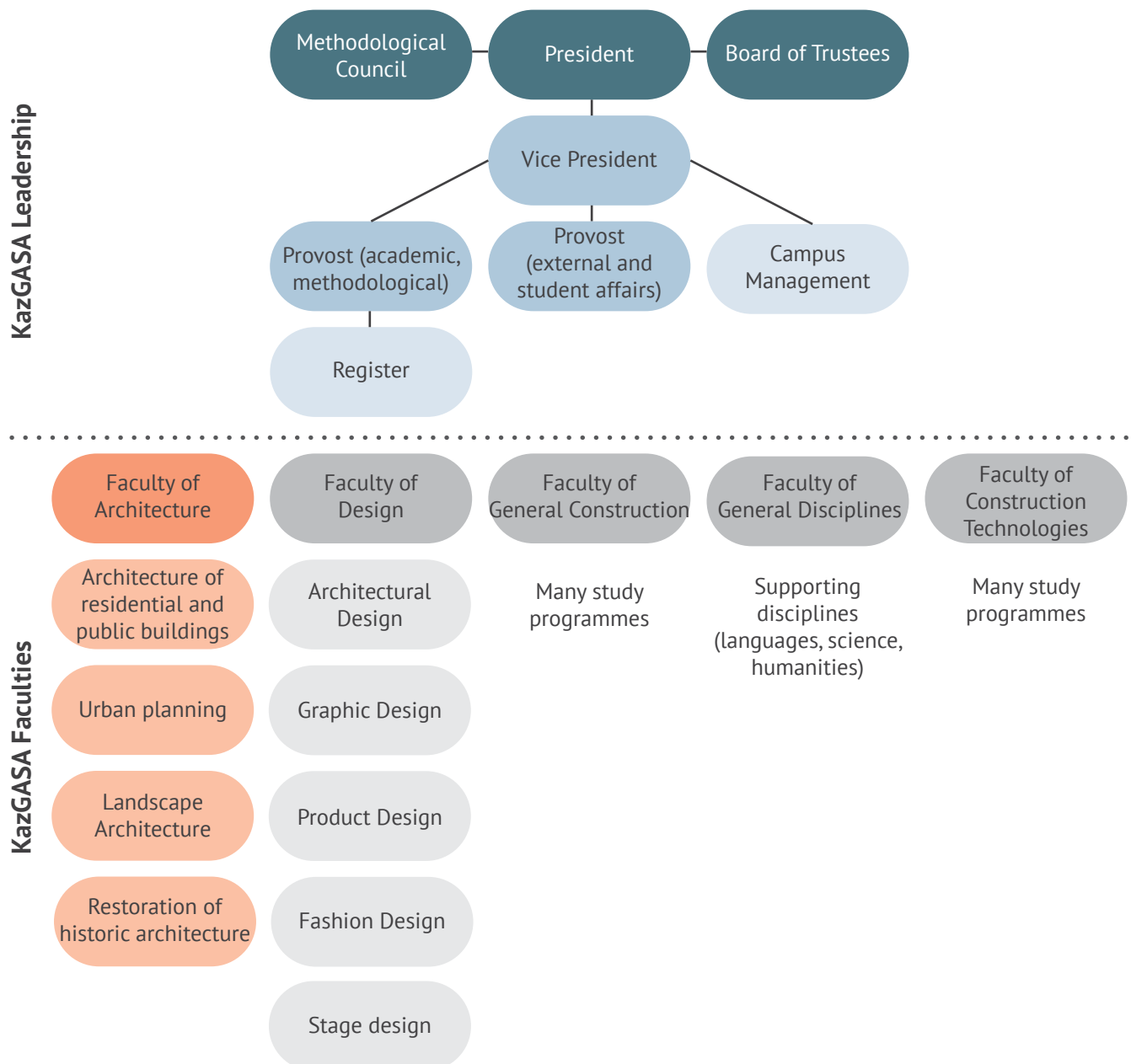


Figure (4) Simplified organisational structure of KazGASA focusing on the Faculty of Architecture.

Chapter 3: Material and Methods

This chapter starts with the introduction of the principles of systems thinking by reviewing the main concepts from systems vocabulary. Similar to the case study from Lund University (LU) by Lidgren et al. (2006) presented in Chapter 2/ p. 27, a systems approach is used in this research to analyse data from interviews, identify barriers and opportunities to integration of sustainability in KazGASA, and propose intervention places that could instigate transformation process in KazGASA towards sustainability education.

Next, the chapter introduces research questions, research methods, the research timeline, as well as the process of data gathering and analysis.

3.1 A systems approach

A systems approach appeared in the research after the first field trip when detailed insights came out, revealing a complex system affecting the education process in KazGASA. It was clear that stakeholder interaction and complex relationships in the decision-making process, including decisions regarding sustainability topics, could not be analysed without understanding the system behind it.

I rely on two major system thinkers and their works - Donella Meadows' "Thinking in Systems" (2008) and Peter Senge's "Fifth Discipline" (2006)⁷. In particular, the research focuses on identifying feedback loops (reinforcing and balancing feedbacks), system archetypes, and mental models that could result in an undesired system state. To propose a desired system state, a concept of leverage points is introduced (Meadows, 1999).

If simplified, in case of this research an undesired system state is KazGASA as HEI without consideration of sustainability problems that continues to operate in the traditional linear way of thinking. The desired system state is KazGASA as HEI that promotes and embodies sustainability education by infusing it in all decisions regarding research, education, university's operation and partnership with outside communities.

3.1.1 Systems vocabulary

Next, I will explore the main vocabulary of the systems approach.

System. According to Meadows (2008), a system must consist of *elements, interconnections and a purpose*. At the same time, a system is more than the sum of its parts, and it exhibits characteristics like resilience, self-organisation and hierarchy. Different events over time compose system behaviour such as growth, stagnations, decline, and so on. System structure is the source of long-term behaviour, and it

consists of *stocks, flows and feedback loops* (Meadows, 2008). In HEIs, stocks could include physical territory (the buildings and other facilities), teachers, and certain tangible attributes. These stocks change over time through the actions of a flow - such as increasing/ decreasing amount of students, teachers retiring, knowledge transfer, changing the ranking of the school, and so on. A stock can be increased by decreasing its outflow rate (fewer students - fewer facilities needed) as well as by increasing its inflow rate (more students - increasing campus size) (Meadows, 2008).

Feedback loops are mechanisms that create consistent behaviour over time. The information delivered by a feedback loop can affect only future behaviour; it cannot correct behaviour that drove the current feedback (Meadows, 2008). There are *balancing (or stabilising) feedback loops* and *reinforcing feedback loops* (Meadows, 2008). For example, in a university system, if there are too many students and not enough teachers and facilities, the quality of educational experience can drop and, as a result, less young people may apply, decreasing the number of students (balancing feedback). On the other hand, the more a university invests into the quality of educational experience, the higher is its rating, which can attract both the brightest students and the best teachers, further increasing the quality of educational experience (reinforcing feedback).

A system rarely has a real boundary because everything in the world is interconnected. Therefore, it is important to remember that "Everything we think we know about the world is a model" (Meadows, 2008, p. 86). While the models strongly correspond with the real world, we tend to underestimate the complexity of the real world. Nevertheless, to understand and analyse the system, we need to simplify it and draw some boundaries (Meadows, 2008).

In case of this research, the boundaries are drawn to focus on KazGASA as a system with physical elements (building, administration, departments,

7. This research uses ebook version of "Fifth Discipline" available on Google Play Books. Therefore, the page numbers correspond with the ebook, not with the 2006 printed book edition.

Box (5) Leverage points (in increasing order of effectiveness) summarised by Donella Meadows (1999, p. 3)

12. Constants, parameters, numbers (such as subsidies, taxes, standards).
11. The sizes of buffers and other stabilizing stocks, relative to their flows.
10. The structure of material stocks and flows (such as transport networks, population age structures).
9. The lengths of delays, relative to the rate of system change.
8. The strength of negative feedback loops, relative to the impacts they are trying to correct against.
7. The gain around driving positive feedback loops.
6. The structure of information flows (who does and does not have access to information).
5. The rules of the system (such as incentives, punishments, constraints).
4. The power to add, change, evolve, or self-organize system structure.
3. The goals of the system.
2. The mindset or paradigm out of which the system – its goals, structure, rules, delays, parameters – arises.
1. The power to transcend paradigms.

teachers, students, etc.), interconnections between them and purpose (for example, to educate future architects and designers). It is part of a larger higher education system in Kazakhstan, influenced by even larger systems on national and international levels.

Sometimes, certain system structures produce the same problematic behaviour, suggesting that those problems are not unique. Those are **system archetypes or traps**, which could be avoided either by recognising them in advance or by altering a system's goal and/ or feedback loops (Meadows, 2008; Senge 2006). Because there is a relatively small number of system archetypes, Senge (2006) suggests that not all management problems are unique. Consequently, higher education institutions may experience the same system archetypes in management as any other organisation.

In some cases, as Senge (2006, p. 239) writes “new insights fail to get put into practice because they conflict with deeply held internal...images that limit us to familiar ways of thinking and acting”. Those are **mental models** - assumptions and generalisations ingrained in our thinking and behaviour due to our social, cultural, political, economic, and personal backgrounds. Mental models can be individual, collective, organisational, and industry-based (Senge demonstrates it by comparing American and Japanese automakers). Therefore, breaking those mental models is extremely difficult. For example, in Post-Soviet countries, thinking and acting from the Soviet system is still prevalent. Older generations

in Kazakhstan found it challenging to transition from socialist, collective economy towards a market economy. Despite growing up in the independent nation, the younger generation is still impacted by thinking and decision made by the older generation.

System's structure, feedback loops, system archetypes and mental models can result in the undesired system, such as the system of linear economy that overlooks environmental and social degradation over a short-term economic gain. To transition a complex system towards the more desirable state, there are places of intervention - **leverage points** (see Box 5) that can produce significant changes through a small action (Meadows, 1999).

People care deeply about parameters and numbers (for example, taxes, wages, or policies to cut air pollution) due to their short-term importance, primarily, in a political race (Meadows, 1999). However, leverage points that target changes in the goal, mindset or paradigm of the system are more effective. Those leverage points also experience more resistance from the system and require long-term investment for the change to happen (Meadows, 1999). Education system itself is a powerful leverage point that can lead societal and global transition towards sustainability by forming thinking and, consequently, acting of growing minds.

The systems vocabulary will be used to analyse KazGASA and recommend intervention points for in-depth and long-term integration of sustainability topics and initiatives by the academy.

3.2 Research Process & Methods

3.2.1 Methodology

The overall approach was based on empirical case study research. A case study is a specific instance that is frequently designed to illustrate a more general principle (Nisbet and Watt, 1984 as cited in Cohen, Manion, & Morrison, 2005). This approach is particularly valuable when the researcher has little control over events, providing a unique example of real people in real situations and explaining concepts more clearly than by merely presenting them with abstract theories or principles (Cohen et al., 2005). According to Cousin (2009), a case study research could compare a range of cases or focus on the particular case for a local understanding, offering “a wealth of readable detail and analysis” (Cousin, 2009, p.135). It also offers the opportunity to investigate the issue in a naturalistic setting (Cousin, 2009), which was the best approach considering a very narrow and specific focus of this particular research.

During the initial fuzzy phase, the research started with the question: *How is sustainability taught in architectural-design schools in Kazakhstan on an undergraduate level?* It was based on my background, expertise and interest, which created a close bond with the case. The research became even more specific when I chose KazGASA as a focus location due to its position as the leading higher education institution in the field of architecture in Kazakhstan that influences other schools across the country.

Based on Cousin’s (2009, p. 2) suggestion that “research methods are in the service of the researcher, not vice versa” and that there is no prescriptive formula to conduct a case study research, my research process was shaped based on the evolution of research questions. Each new finding aroused new questions and confirmed or rejected previous assumptions. Empirical data was collected through desk research, semi-structured interviews, informal talks, and writing personal research diary.

While there are many case studies about sustainability in higher education institutions or sustainability in architectural education, based on the search in international peer-reviewed journals, no such studies have been conducted in Kazakhstan. Generally, there are scarce research papers both, about higher education and sustainability initiatives in Kazakhstan.

Semi-structured interviews

Semi-structured and unstructured interviews are favourable when researching complex experiences (Cousin, 2009). Cousin (2009) states that semi-structured interviews are always a working document that can be adjusted throughout the interviews. If too many questions are asked the interview would be more driven by the hypothesis of a researcher (Cousin, 2009) rather than unveiling phenomena from the perspective of an interviewee. According to Rubin and Rubin (2005), semi-structured interviews may include main questions, probes and follow-up questions (as cited in Cousin, 2009). It is recommended to have five to eight main questions identified from the themes for the interview.

Research Diary

I started a research diary to write down immediate thoughts after the interviews and personal reflections. Those notes helped me later during the analysis of interviews as several months passed between interviewing, transcribing and analysis, and I could not remember non-linguistic behaviour. Also, it served as a personal diary of my doubts and well-being throughout the research.

3.2.2 Literature Review

Muratovski (2016) describes several approaches to the literature review to consider: Chronological, Historical, Thematic, Methodological, Theoretical, and Meta-Analysis. Among those approached, the thematic review is the most relevant to this research.

The purpose of the thematic reviews is to help the researchers examine various perspectives about the phenomenon in question – whether this might be converging research approaches, methodologies, or findings (Muratovski, 2016). The method could be relevant to understand what kind of themes or topics are common in the available literature.

The literature review consisted of both comprehensive and narrow approach and covered the following themes:

- Sustainability and sustainable development
- Role of design in sustainability paradigm
- Sustainability in higher education institutions
- Barriers and opportunities to sustainability in HEI
- organisational change in HEI towards sustainability
- Architectural-design education and sustainability
- Sustainability in Kazakhstan
- The education system in Kazakhstan
- Architectural-design education in Kazakhstan

Literature Review was conducted in pair with empirical research, complementing additional research questions that emerged throughout the process. Limitation included scarcity of literature about design education in Kazakhstan, especially, in English. Therefore, I reviewed relevant sources in Russian, which were, nevertheless, quite scarce or did not touch the topic of sustainability.

3.2.3 Empirical Research

Starting from February 2017, I had three trips to KazGASA, and each trip consisted of multiple visits. Figure 5 shows the Research Timeline.

Overall I interviewed fourteen people. All interviews were conducted on Russian.

Nine interviews with faculty and academic administration members:

- Four senior teaching professors (two of them also have additional administrative duties)
- One senior academic administration member
- Two instructors (junior faculty members in the architectural department), and
- One general subject teacher.
- Four interviews with six students from 2nd, 3rd, and 4th-year of studies. Some students were interviewed in pairs due to lack of time, but it also created a more comfortable setting for the participants.

Among faculty and administration members, there was only one male participant. Overall, there are more female employees in KazGASA. Age of participants varied: junior faculty members are around 30 years old, while senior members are around 45-60 years old. Among students, the female/male ratio is equal, and the age of students correspond with their study year: 19-24 years old. All interview participants are Kazakhstani nationals, and ethnicity wise majority are Kazakhs. While interviewees give a fair representation of demographics of KazGASA, some members are represented less.

Interviews were anonymous, and I verbally informed the participants about it. I also received their verbal consent to record the interviews for transcribing purposes only.

Furthermore, I conducted three lectures with Q&A session, which consisted of giving presentations for 2nd, 3rd, and 4th-year students about sustainability and sustainable development, and how those topics may affect architectural design decisions. It was a very introductory lecture based on my own experience and knowledge. The presentation was organised in interactive format when I asked open-ended questions to understand audience perspective on sustainability topics in general and specifically in their educational experience (Figure 7, p. 49).

During the visits, I was able to interact with teachers outside of interview settings, for example,

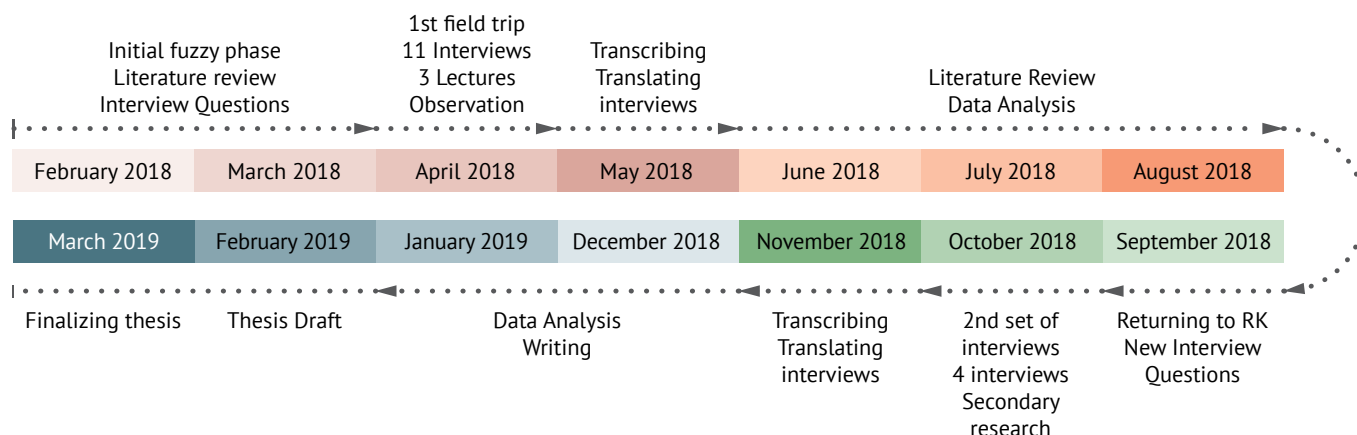


Figure (5) Research Timeline

by having lunch or tea break together. Some serious issues came up from those informal conversations, which I remarked in my research diary and followed up in interviews.

Initial research questions

My initial broader interest has been the implementation of sustainability in architectural-design education in Kazakhstan on the undergraduate level. Drawing motivation from my own experience, I wanted to explore how design education can contribute to transitioning of Kazakhstan towards a more sustainable society. After deciding to focus on KazGASA, I was curious about *What is the status of sustainability initiatives in KazGASA?*

The first informal trip happened in February when I was just looking into the possibility of this research topic. After returning to Almaty for winter holidays, through my friend who is teaching in KazGASA, I was able to establish contact with few professors and had informal conversations with them. The initial meeting helped to set a ground for the next meeting, familiarising teachers in KazGASA with myself and my research interest. We also agreed on the dates for my 'official' field trip.

First field trip

Based on the availability of teachers in KazGASA, I planned my second field trip in the middle of April. The trip was organised in a hurry, without a clear picture of what I am looking for. In fact, at that stage, my research questions were very broad and fuzzy. However, the fuzziness turned into an opportunity as after the trip I discovered some intrinsic insights,

leading to reconsideration of my initial assumptions.

It is worth noting that before the trip, I did two test interviews in Helsinki with Aalto teachers. The testing helped to check the duration of interviews, clarity and manageability of questions.

During this trip, I conducted the first set of semi-structured interviews with 11 people (see Box 6) and gave three lectures with Q&A session. Sharp (2002) mentions the existence of three subcultures within universities that have different decision-making practices, priorities and goals: students, faculty, and administration. Consequently, interviewees were selected to represent voices of each sub-culture and based on their availability during the limited period I was in Almaty. I met interviewees through my friend, which eased the initial trust-building.

Initially, I aimed to explore the research topic only from the perspective of students. However, the phenomenon proved to be less relevant in Kazakhstani context due to low interest and low awareness of sustainability challenges among students. While it is also a valuable finding, it was discovered during the field trip that in recent years KazGASA had made significant changes to the curriculum to meet international standards and industry requirements.

As a result, I decided to look into the decision-making process behind those changes as the process could be relevant for the integration of sustainability initiatives. As mentioned above, the need for a systems approach came out when the first set of interviews revealed a complex system affecting the education process in KazGASA.

Box (6) Questions for the first set of interviews (April)

1. How would you define the term sustainability (sustainable development)?
2. Do you see the role of designers and architects in promoting sustainable development?
3. Do you think it is the university task to address sustainability issues?
4. Do you think sustainability is important in design education?
5. In your opinion, is sustainability integrated into bachelor education in KazGASA?
 - If yes, how and to what degree?
6. Are there sustainability-related courses or topics?
7. What kind of knowledge and skills are being taught?
8. Do you think those courses/ topics are enough?
 - If not, what could be the reason for lack of sustainability-related themes?
9. Is there a process for more integration of sustainability or/ and ecological design related topics into the education programme in KazGASA?
10. Who leads the process of integration of sustainability?
 - Government? Ministry of Education? University administration? Teachers? Students?
11. Is there a multidisciplinary collaboration in KazGASA?
12. Do KazGASA work with real clients or external stakeholders when developing a design brief?
13. Does KazGASA develop the courses to integrate more sustainability-related topics?
14. What kind of professionals is KazGASA aiming to educate? What are the main knowledge and expertise KazGASA wants to give to students?
15. Do you think BA students are concerned about sustainability issues, such as social and ecological challenges?
16. In your opinion, can students' points of view and demands affect course and curriculum development? If yes, how? If not why?

Therefore, more detailed questions appeared:

- Who are the stakeholders in KazGASA?
- How does the decision-making process happen in KazGASA?
- Where are the opportunities and barriers for integration of sustainability in KazGASA?
- Where are opportunities to extend curriculum change happening in KazGASA towards more extensive organisational/ institutional change for sustainability?

2nd set of interviews

KazGASA has examination period in May and study break during summer. As a result, the second set of interviews were conducted in October. If the

first interviews were quite broad and followed an interviewee narrative, the second set of interviews (see Box 7) were based on the emerging data analysis, focusing on areas where I was missing a cohesive picture. I interviewed four people, who were carefully selected, including re-interviewing one of the previous respondents.

I attempted to interview more people from upper administration and general subject teachers whose courses were relevant to the research topic. However, approached people were busy and denied to give an interview. Therefore, considering the amount of gathered data, it seemed there was enough information to answer research questions.

Box (7) Additional questions for the second set of interviews (October)

What is the mission and goal of KazGASA?

How do changes happen in KazGASA?

What was the major recent change? What was going on? Did administration support it?

Who has the power for decision making?

Who do you think can make decisions about sustainability initiatives?

What would be the main factor to expand sustainability activities in KazGASA?

Would the academy leadership invest in it? What would make them do so?

Where do you see the opportunity for change? How do you envision the future of KazGASA?

How is the relationship between teachers?

How does cooperation work in KazGASA? (competition, collaboration)

Do teachers exchange interest/ knowledge/ expertise? If yes, how does it work?

What kind of barriers do teachers encounter?

Would teachers like to learn about sustainable development?

How are decisions made about changes in the curriculum?

How does the implementation of the module system is progressing?

Studio projects: how is a brief defined? What is the design project?

Does the Ministry of Education have requirements about environmental/ social/ economic aspects of education? What courses are obligated by the Ministry?

What kind of partners does KazGASA work with?

Does KazGASA work with citizen activists? What about city administration (Almaty)?

3.2.4 Data analysis

Cousin (2009) describes that in the interpretive framework researchers acknowledge the impossibility of complete objectivity, and insert themselves freely in the research process. The aim is to generate understanding and insights into a complex context (Cousin, 2009). Because there is a high likelihood that my readers are less familiar with Kazakhstani settings, they have to depend on my textual “re-presentation” of the case (Cousin, 2009, p. 9). Therefore, when reading this case study research, one should remember that the interview questions and interpretation of answers are affected by my subjectivity.

Data analysis started with transcribing recorded interviews and translating them into English. I transcribed in details the interviews I found the most important and took notes for the less relevant ones. During translation, I tried to look into the broader context and select words with the most trustworthy interpretation.

Translated documents were further analysed to define core categories and sub-categories (Glasser and Strauss, 1967 as cited in Cousin, 2009). To make sure data is reliable, I categorised findings that were mentioned by several people. Core categories

included, for example, “understanding sustainability”, and relevant quotes were selected. Some quotes were used several times. When working on the “Results” section, I re-read interviews again to retain the narrative value of interviews (Cousin, 2009).

Despite interviews being anonymous, at the beginning of data analysis, due to lack of research experience, I kept the names of teachers for my clarity. Afterwards, I coded and removed the names when archiving the original transcribes, translated documents, and analysis documents. Student interviews were labelled as Student 1, Student 2, etc., and are harder to identify.

Having in mind Cousin’s (2009) description of interpretivism and to avoid cherry-picking quotes and assure trustworthiness, I re-listened recordings after several months when preparing for the next round of interviews and rechecked the original Russian transcriptions and English translations.

Finally, systems thinking was used as a tool to analyse KazGASA as a system and an organisation facing change process; and to propose original recommendations.

The next chapter examines in details interview findings and main categories that emerged from the data analysis.



Figure (6) Main Hall in KazGASA.



Figure (7) Giving a short presentation for KazGASA students about sustainable development.

Chapter 4: Research Results

This chapter summarises findings, core categories and sub-categories that emerged from analysing interviews. Findings were divided into sub-chapters:

- *4.1 Understanding Sustainability.* The ambiguous translation of the terms in Russian and lack of promotion SDGs on the national level are suggested causes of diverse interpretation of terms among interviewees.
- *4.2 KazGASA as organisation* examines the goal and mission of the academy, stakeholders, and partnerships according to interviewees.
- *4.3 Decision-making process in KazGASA* discusses stakeholders involved in the decision making process and their influence factors. Another factor resulting in changes are surveys that are regularly conducted to ensure the quality of educational experience. Finally, there is an example of a recent change process - module based study programme initiative.

- *4.4 Sustainability in KazGASA* unveils two central teaching and research areas in KazGASA that are related to sustainability - Energy Efficiency and Regionalism. Afterwards, following the Review of Literature, the sub-chapter discusses barriers that interviewees face in KazGASA and opportunities that could contribute to the integration of initiatives related to sustainability.

An important factor during the interviews was the desire of people “to place themselves in a good light” (Cousin, 2009, p. 76). During my interviews, I noticed that interviewees were looking for my approval of their answers. Also, they often used the terms Sustainability and Sustainable Development that I have used in my questions despite the fact those terms are not used frequently in speech. Moreover, those terms when translated into Russian could be interpreted differently, which I explore below.

4.1 Understanding “Sustainability”

4.1.1 Defining Sustainability and Sustainable Development

During all interviews, an important question was “How do you understand sustainability and sustainable development?”. The answers were diverse and reflected the respondents’ personal and professional background.

Sustainability and sustainable development were associated with:

- Developing and improving the organisation to reach the next level.
- Ensuring the quality of education.
- Formation of a comfortable living environment for people.
- Development of human potential from all sides; an integrated development, which includes environmental development, and sociological, and liberal in general.
- Adequate and rational architectural planning.
- Opportunity to extend the life of a building or public space.
- Preservation of all the positive aspects of the urban and natural environment for future generations.
- Conservation of resources.
- Connected to ecological and development towards a good direction. Develop the economy simultaneously, but do not harm the environment.
- Development of the present generation that takes into account the interests of future generations.

Lost in translation

Several interviewees pointed out that terms “sustainability” and “sustainable development” when translated into Russian do not convey the same meaning. “Sustainable” is translated as устойчивый

“us-toi-chi-vyi”, which can also mean stable, steady, consistent, resilient (multitrans.ru online translator). The interpretation of sustainable development “ustoichivoe razvitiye” has not been popularised enough in Kazakhstan to disassociate the word “ustoichivoe” from other translations such as balanced/stable/ steady. In the Kazakh language, the word sustainable is translated as “turaqly”, which also means permanent/stable. As one of the teachers said:

Sustainable development is a hard term for many. What kind of sustainable⁸ [stable, well-balanced], and was it before not sustainable [stable, well-balanced]? Buildings, structures, territories...

The meaning of the term sustainability in Russian translation is stability [statics]. Something must be stable; the building is stable...so that it does not bend down, do not fall, do not collapse, in this sense. Regarding global ecology, green aspects of architectural design, and generally of the environment, many do not perceive it so. Here it is very difficult to translate the term adequately.

According to the other teacher:

There is an issue with the translation of the term. If there is a person who speaks English and you would say sustainable architecture on English, he might understand you. However, when you say the term in Russian, it is not clear. It is not about the term, but what we associate with the term. I think this is where the misunderstanding comes from.

One could do entire research on the semantics of terms sustainability and sustainable development and distortion of its meaning when translated into different languages, but it is not the focus of

8. In this entire quote the word устойчивый “us-toi-chi-vyi” was translated as sustainable, however during the conversation interviewee implied the ambiguity of the term in Russian. Therefore, when translated the quote somehow loses the initial meaning, and I put the other relevant translations in brackets.

this research. Nevertheless, with signage of 2030 Agenda, the UN members committed to adopting the UN definition of the terms with the consideration of environmental, social and economic challenges. In Kazakhstan, the discussion happens on the government and international scale, but education policies such as the Ministry of Education and Science strategic plan for 2017-2021 (Chapter 2, p. 36) lack principles of SDGs or ESD.

At the moment, universities do not have incentives to include ESD in their mission and teach about sustainability challenges. Therefore, it can be argued that the government of Kazakhstan has not put enough efforts and resources to spread and explain the sustainable development paradigm to the public. Coupled with an ambiguous translation, it is not surprising that students, teachers, and administration in KazGASA have a diverse interpretation of the term.

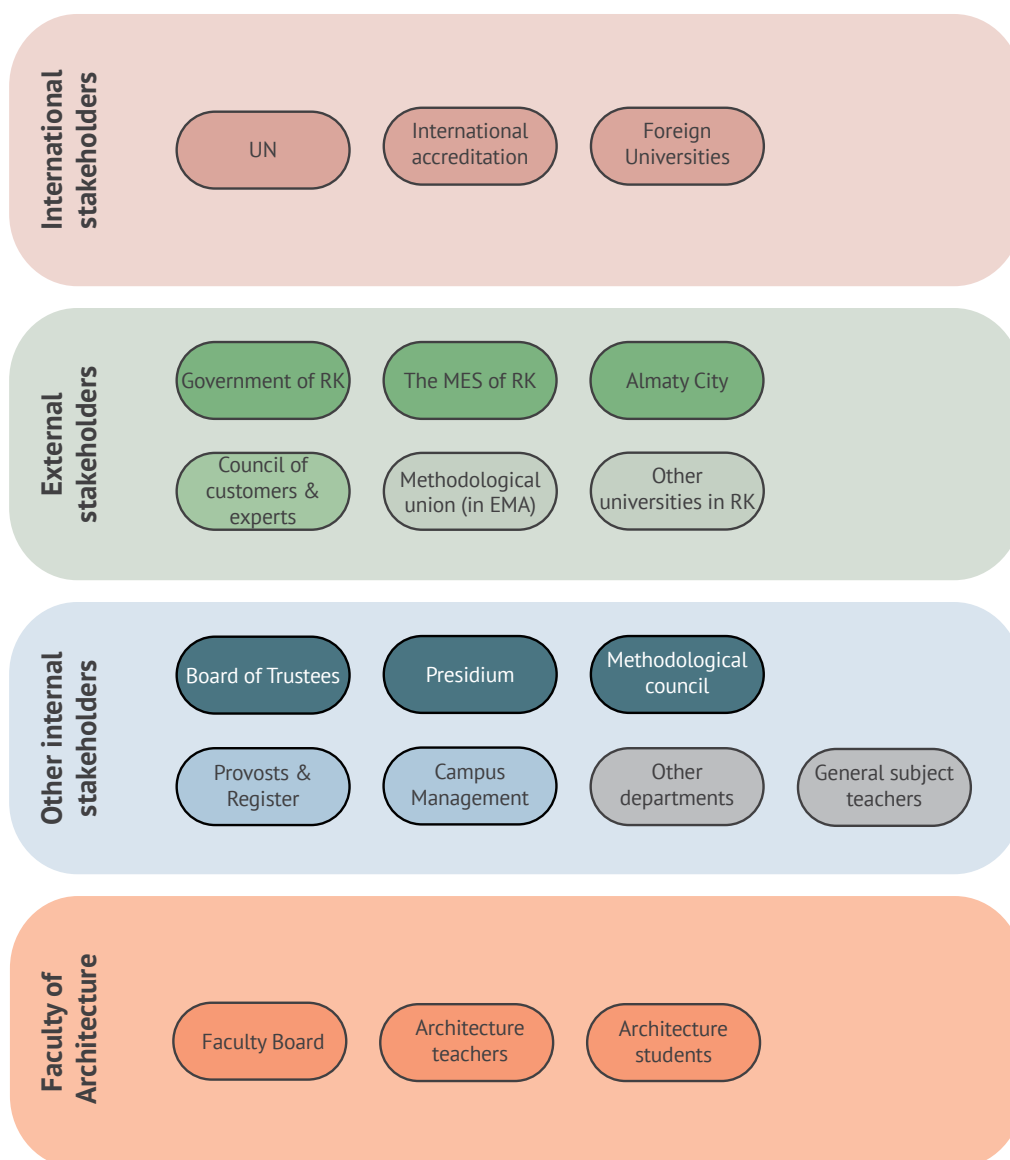


Figure (8) Stakeholders of KazGASA (see also sub-chapter 2.3 KazGASA)

4.2 KazGASA as organisation

4.2.1 Goal & mission

As previously mentioned, KazGASA is the leading HEI in the fields of architecture and design in Kazakhstan and ranked first by IAAR (Independent Agency for Accreditation and Rating in Kazakhstan). KazGASA is a key actor defining the methodological and curriculum development of all architectural schools in the country. However, it is a privately owned academy, and it receives modest financial support from the state.

One of the interviewees describes the goal of the academy through the lens of its mission:

It is a preparation of highly qualified professionals in the field of architecture, design and construction. At the same time, our goal is to have professionals who are not narrowly trained to practice only at the Republic of Kazakhstan, but they should be experts who can navigate without problems on a global scale... We want to have a graduate, who has a strong civic position and certain values, honours traditions, and understands that he⁹ is a representative, a graduate of alma mater.

It is worth noting that the mission of KazGASA focuses more on social responsibility and developing professional capabilities, but does not mention environmental responsibility. Nevertheless, teachers whom I interviewed expressed more holistic interpretations of highly qualified professionals and passionately discussed the merits that they aim to cultivate among students and, respectively, graduates. When asked “What kind of professionals is KazGASA aiming to educate?”, teachers and administrative staff responded:

- Be a team player
- Have a conscious attitude towards education

9. In Russian language each noun is assigned a gender: masculine, feminine, and neutral. For example, in this case noun “graduate” is masculine, therefore, an interviewee refers to all graduates regardless of actual gender as “he”. Here and afterwards the translation is direct from Russian.

- Be ready for professional practice
- Be a competent professional in design
- Be resilient [sustainable] to changes
- Solve regional design problems
- Develop artistic and spatial thinking
- Be extremely creative, deliver something new and have a critical viewpoint
- Have a vision and imagine future
- Be able to design energy-efficient houses
- Cultivate of an all-around identity of a person with broad views, who takes into account different factors
- Able to understand politics, society, complexity of the world and the effect of globalisation on the development of humanity
- Have a certain ecological culture

4.2.2 Stakeholders

KazGASA is a middle-sized institution with internal and external stakeholders. The internal stakeholders are within the organisation, meaning in case of HEIs professors, researchers, administrative staff and students (Lidgren et al., 2006). In KazGASA, administrative staff consist of academic administration and management, and there is also presidium (see Figure 4, p. 39 and Figure 8).

External stakeholders are more difficult to specify but can be defined as influences outside the organisation (Lidgren et al., 2006). KazGASA has several categories of external stakeholders. The list could be more broad, but limited for the purpose of this research.

- Professional organisations: Board of Trustees, the Council of Customers and expert commission, partnering companies);
- The education system in RK: other architectural universities in Kazakhstan, Methodological union of architectural schools in RK (within Educational and Methodological Association, sub-chapter 2.3), the Ministry of Education and Science;

- The State: city of Almaty (including its department of Education), the government of RK;
- International: partnering universities abroad, accreditation agencies, both local and international agencies such as UIA (International Union of Architects); UN (including UNDP, UNESCO)

The board of Trustees consists of prominent graduates and construction field professionals. The members actively participate in KazGASA development plans and decision-making process working together with administration and teachers. They also sponsor student scholarships and provide knowledge-based expertise.

The Council of Customers and expert commission is a consultancy body of construction field professionals, who participate in the development of curriculum and methodology based on up-to-date qualifications that the labour market is seeking.

4.2.3 Partnership and outreach

There is a methodological union of 9 architectural schools in Kazakhstan, which is lead by KazGASA. It is a part of a larger union of universities that prepare professionals in the construction fields - architecture, design, civil engineering, and construction materials (KazGASA, n.d.).

A methodological union meets twice a year to discuss methodological issues, curricula, and issues that the union members are facing. One of the meetings happens in KazGASA, while the second one is organised elsewhere.

Other academic partners are foreign universities, with which KazGASA signed cooperation agreements regarding participation in conferences and workshops, exchange of students, and so on (from interviews).

KazGASA cooperates with companies and organisations, in the city of Almaty and the whole country to organise internship for students. From Year 1 to Year 4, every summer students go through a 4-week long internship.

Also, on the republican level, KazGASA organises scientific conferences, Olympiads and architectural competitions for students of all architectural schools. Several competitions are organised in cooperation with companies like Isover, Autodesk, KNAUF and Saint-Gobain. Students highly value those additional activities as they can further develop design skills and enrich personal portfolios. Based on interviews, competitions and conferences allow students to work on a project individually and extensively without constraints of a regular architectural studio course.

On a regional level, the academy is a part of the Alliance of 38 Universities of the city of Almaty. KazGASA youth committee works closely with the city's Department of Youth Affairs by participating in all events organised by the city. Moreover, academic members of the Faculty of Architecture have been invited to discuss and provide their expertise in the development of Almaty's master plan for the upcoming decades.

4.3 Decision-making process in KazGASA

4.3.1 Stakeholders

There is a complex interaction of stakeholders in the process of decision and change making in KazGASA (see Figure 9). The process can be approached from bottom up (teachers, students) or top-down (UN, the government of RK). Below I review the role of each major stakeholder in details, in the order identified by the interviewees.

The state and the Ministry of Education and Science (MES)

Changes in the education system

According to a senior administration member, the government and the Ministry of Education and Science are leading force behind changes.

The first factor that affects changes is the government. The Ministry of Education and Science sets certain tasks for higher education institutions, and, as we are part of this community and subordinate to the Ministry, we are obliged to adjust our work with their changes of conditions.

As mentioned previously, in 2010 Kazakhstan officially joined the Bologna System (IQAA, n.d.). With the launch of Strategy 2050 and government programs such as Digital Kazakhstan and Ruhani Zhangyry (a platform to modernise the public consciousness), all combined in the last ten years there have been dramatic changes in the country's education system.

The standards change often. The last state standard that we have adopted was in 2016. Now we teach based on this standard. The Ministry sends us a certain scheme of curricula, according to which students should study, and we adjust it depending on the specifics of our speciality. For example, in recent years, the required number of humanities disciplines first decreased, but it has increased back. Currently, due to cardinal changes

in education, literally, everything is changing up to the classification of speciality. Although, it is a foundational document, which defines our place in the education system on the republic level.

Unfortunately, the education system in our country has suffered the most from reforms. Many education ministers changed [over the years]. This is a search for our education system because, on the one hand, we must comply with international education standards of the Bologna process, on the other hand, we must not lose all the best that was accumulated from the Soviet education system. We must also look for our own national identity.. Unfortunately, these reforms feel like jumping [rushing] from one side to another.

Funding

Despite KazGASA being a privately owned organisation, as mentioned in the previous chapter, the state provides government scholarships for incoming new students¹⁰ and allocates funding for academic mobility. Also, there are different funds for teacher's training or other activities. To participate in any funding, a private HEI should have international accreditation.

However, according to a senior administration member, the funding is not adequate. Coupled with the strong devaluation of the national currency¹¹, tuition fees increased drastically in recent years.

We have to increase tuition fees to help our students so that the university can develop further, and our teachers can live with dignity,

10. As mentioned in Chapter 2, upon graduation from high school, all students who want to continue studying in HEI in Kazakhstan should pass Unified National Testing. Based on the result of testing, they can receive a government scholarship that covers the cost of tuition fees and offers monthly stipends. However, the number of scholarships is limited, especially, for popular career choices.

11. In the history of independent Kazakhstan, there were several occasions of strong devaluations of national currency tenge. The most recent one happened in 2015 when tenge lost its value by 50% over the year. It led to the sudden increase in prices of almost all products and services, including food, and consequently to economic recession on the national level.

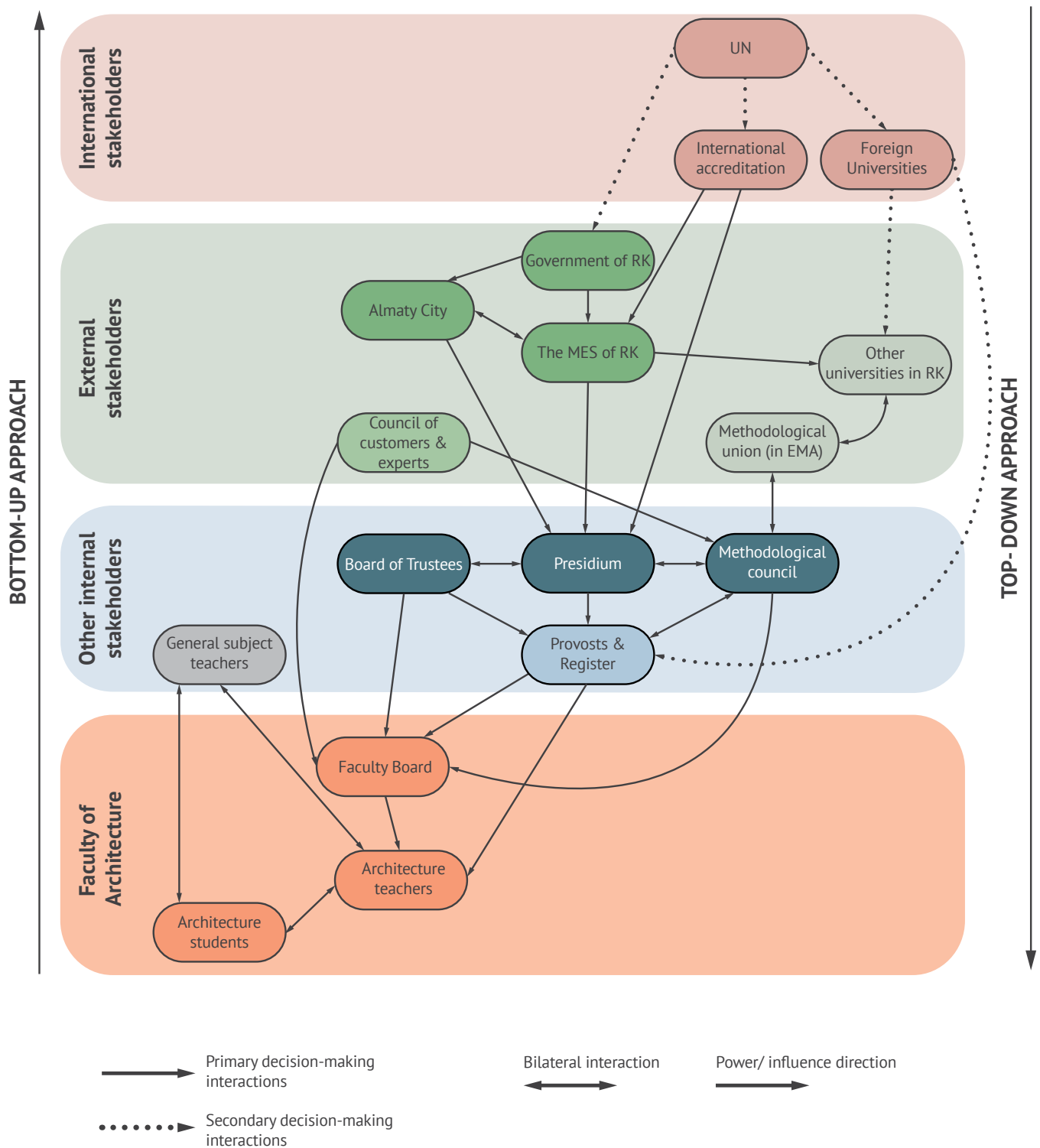


Figure (9) Decision-making process and stakeholders interaction in KazGASA from bottom up (primary decision-making interactions) or top-down (secondary decision making interactions) approaches.

work with dignity. These are market conditions. If economic conditions were different, our fees would remain the same as it was five years ago.

Standard study programmes

The Ministry of Education and Science sets state standards for the curriculum. Those standards are especially demanding towards general subjects. KazGASA can formulate the curriculum and teaching methodology of architectural subjects. However, the curriculum of general subjects such as Politics, Ecology, Health and Safety, Sociology is largely defined by the Ministry, and it is common for all higher education institutions with little room for manoeuvre.

We have state standards, and we must follow the standards. There are standardised study programs in law, sociology, political science, religious studies... Moreover, these standardised programs contain mandatory topics. 70% [of curriculum] we must follow standardised programs and 30% we can modify and include some of our topics.

The ministry compiles many compulsory components in the study program, but there is always a space in them where you can include considerations of the speciality. They can take into account the specificity of the university because the standards are given in the more generalised form.

Teachers, the faculty council, the methodological council

Besides participating in a methodological union on the national level, there is a methodological council in KazGASA, which consists of a representative from each faculty in KazGASA.

The Methodical Council of KazGASA coordinates the activity of methodical provision with educational programs of the academy, encourages quality of content of higher education according to requirements of the

compulsory state standard of the higher and postgraduate education (KazGASA, n.d.).

Teachers and faculty council are the main drivers in the decision-making process. More experienced teachers with doctoral degrees have more authority to suggest changes in the curriculum. Any suggestion should be submitted to the faculty's dean and afterwards discussed in the faculty council meeting. When the faculty members reach a consensus, those initiatives are taken to the methodological council and a pro-rector of academic affairs.

When suggesting and making changes, the faculty council seeks advice from the Council of Customers and expert commission. The labour market demands is one of the main factors behind curriculum changes.

International accreditation & partners

As mentioned in the previous chapter, in 2007 and again in 2011, undergraduate Architecture programme in KazGASA passed UNESCO UIA international accreditation (KazGASA, n.d.).

Based on the interviews, the international accreditation process led to several major changes, including increasing research on regionalism, cooperation with UNDP to develop a course on the energy efficiency of buildings and Module based study programme initiative, which are discussed later in this chapter. However, I was not able to access actual requirements or recommendations from UNESCO UIA committee to KazGASA.

Students

The last, but not the least, students have an indirect but crucial role in the decision-making process. KazGASA has only one student association, and according to the students the association is quite inactive and only organises some entertaining events. It does not actively lobby students' interests in the university. However, students' opinions are collected through anonymous surveys. In addition, 1-2 active students are invited to the faculty

council meeting to express collective concerns and suggestions of students. Interviewees also mentioned changing teaching methods due to differences in how current generations interact and perceive information.

If you compare what they were ten years ago and how they are now, different generations have grown, they are absolutely different. Their perceptions are completely different and, consequently, for them, we are changing the method of teaching.

Students usually express how they perceive the course overall...Of course, teachers have over 20, 30, 40 years of experience. However, it happens that students catch on modern innovations faster.

4.3.2 Surveys and evaluations

There is a Laboratory of Education, which operates independently from faculties and management, and responds directly to the president of the academy.

Yearly at least twelve surveys are conducted among both teachers and students addressing issues like organisations of internships, the organisation of exams, the work of teachers, a moral and psychological climate in the team, the work of the security service, and the work of food services. Only the head of the laboratory sees and analyses survey results. Surveys are anonymous, there is no surname, nothing is recorded, and the information is passed straight to the president.

Afterwards, evaluations are given to faculty deans and discussed openly during the faculty meetings. If there are concerns regarding individual teachers, they are addressed privately. Teachers' rating is important and can impact the bonus payments they receive or even lead to dismissal. Consequently, few teachers remarked that they put many efforts to improve their teaching, introduce new topics and maintain good relationships with students.

4.3.3 Module based study programme initiative

The most interesting change happening currently in KazGASA is an initiative to implement a module-based study programme in undergraduate

architectural education. The idea for the initiative came after international accreditation, based on recommendations of the accreditation committee.

The main purpose of the initiative is to strengthen interdisciplinarity. The current curriculum would remain the same (see Table 5), but the content of courses would be more integrated with the pivotal architectural disciplines. For example, in the 4th year, there are two pivotal disciplines: Regional Architecture and the Architectural Studio. Topics in Regional Architecture will serve as the theoretical base for the studio project, and other general courses should also aim to include regionalism in the course content.

It is worth noting that during the 1st year and 2nd year, students take more general courses and art courses aimed to develop artistic and spatial thinking. They study specialised architectural courses only from the 3rd year.

However, because the MES sets standard study programmes for general disciplines and only limited hours can be allocated towards elective topics, the proposed module-based system faced setbacks from the general discipline teachers.

The idea was to connect as much as possible with a speciality, for example, an architectural project, and that all topics [in other subjects] were dependent on the architectural project ... We can devote 1-2 lessons to be studied precisely through the prism of architecture, but, of course, not all [lessons]. We have our program, which we must teach. Therefore, I am only partially supportive.

To avoid the conflict of interests between architectural and general disciplines teachers, all involved teachers were notified by email and invited to the presentation and discussion of the initiative. The initiative was discussed during the Faculty of Architecture Council meeting, as well as with the Council of Customers and expert commission.

Nevertheless, there has been opposition from the teachers of general disciplines and tension between architecture teachers about the details of the initiative.

Table (5) Current Curriculum of the undergraduate architectural programme in KazGASA (adapted and translated from the material provided by the interviewee).

| Year 1 | |
|--|--|
| Term 1 | Term 2 |
| Foundation of Architectural Design Kazakh/ Russian Language Communication Technologies Drawing & Painting 1 Engineering Drawing 1 Architectural Composition Mathematics Art History and Culturology | Architectural Studio 1 (Design of small-scale architectural forms) Modern History of Kazakhstan Foreign Language (English) Kazakh/ Russian Language Architectural Graphics and Model-making Painting AutoCAD Construction Materials |
| Year 2 | |
| Term 1 | Term 2 |
| Architectural Studio 2 Foreign Language (English) Kazakh/ Russian Language Sociology, Politics, Law & Religion (combined) Introduction to Economics Architecture 1 Engineering Drawing 3 Sculpture 1 Professional Software 1 | Architectural Studio 3 Philosophy Industry Related Foreign Language (English) Industry Related Kazakh/ Russian Language Architectural Drawing World Architecture History Professional Software 2 (3D Modelling) Geodetic Surveying |
| Year 3 | |
| Term 1 | Term 2 |
| Ecology & Human Life Safety Architectural Studio 4 History of Architecture in Kazakhstan Professional Software 3 Engineering Mechanics Architectural Physics | Architectural Studio 5 Introduction to Economics Engineering Systems Of Buildings and Infrastructure Building Construction 2 Urban Environment & Landscape Technologies of Construction Manufacturing Introduction to City Planning |
| Year 4 | |
| Term 1 | Term 2 |
| Architectural Studio 6 Introduction to Law Introduction to Human Life Safety Landscape Architecture City Planning Economics and Underground Urbanistics Engineering Development and Transportation Building Construction 2 | Architectural Studio 7 Architecture Of Unique Buildings Regional Architecture Construction Drawings Modern Construction Materials |
| Year 5 | |
| Restoration of buildings and communities Project Budgeting Final Graduation project | |

4.4 Sustainability in KazGASA

4.4.1 Is there sustainability in KazGASA?

Participants had divided opinion about the level of integration of sustainability topics in undergraduate architectural education experience in KazGASA. Reflecting Wright (2003), several teachers claimed that pro-environmental and socially inclusive factors are fundamental to architectural methods of design and are already part of the existing curriculum.

There are disciplines like ecology, human life safety. The topic of environmentalism, I think should always be present. However, what is environmentalism? Environmentalism is the consideration of the climate, first of all, materials.

In landscape architecture course, especially, in the introduction of lecture courses, we always say that the basic paradigms of modern architecture are sustainable¹² architecture, sustainable urban environment; so our discipline is built on these concepts. The very discipline of landscape architecture and all that I teach are aimed at forming a sustainable environment.

However, an interviewee pointed out that due to the gap between theory and practice, students may not employ the knowledge.

As part of our speciality, and in our university, we raise issues of ecology and sustainable development as part of design, planning or architectural forms, the choice of materials for structures or finishing... This is a mandatory requirement for a graduation project, but how it is carried out is another matter.

12. One should take into consideration the earlier notes regarding that interviewees repeated the use of terms sustainability and sustainable development after my questions despite the fact those terms are not used frequently in speech. Nevertheless, despite ambiguous translation, there was an understanding of what exactly is being discussed.

Other teachers did not share the enthusiasm of their colleagues. Studio teacher mentioned that due to lack of time and overloaded curriculum sustainability topics are tossed aside. Also, there is no top-down initiative for the integration of sustainable development on the organisation level.

I think every teacher when conducting their lectures, includes it on their own level... However, there is still a path to go. I think there are some talks, discussions with students, lectures, where the issues are raised, but, as I said, the interpretation is unclear. I think it would take time.

Two main research and academic focus areas in the Department of Architecture in KazGASA relevant to sustainable development are Energy Efficiency and Regionalism.

4.4.2 Energy Efficiency

In 2012, in cooperation with UNDP KazGASA introduced a course on energy-efficient building design on the undergraduate level. “Design of energy-efficient building” course is taught during the 3rd year. Students learn about passive housing; energy efficient technologies in building design; LEED, BREEAM certification schemes; and examine global and local case studies (Isabayev, 2016). They also complete a practical task designing an energy-efficient single family house (Figure 10), which aims to teach students to design passive houses in practice.

According to students, many of them learn about sustainability and energy-efficiency in architecture during this particular course.

Recently, we had a course on energy-efficient buildings, which blew our minds as we realised there could be zero-emission buildings that are useful (good/ beneficial/ helpful). We asked why those type of buildings are not built in our city, and the reply was that there are issues with the government, procurement, etc.

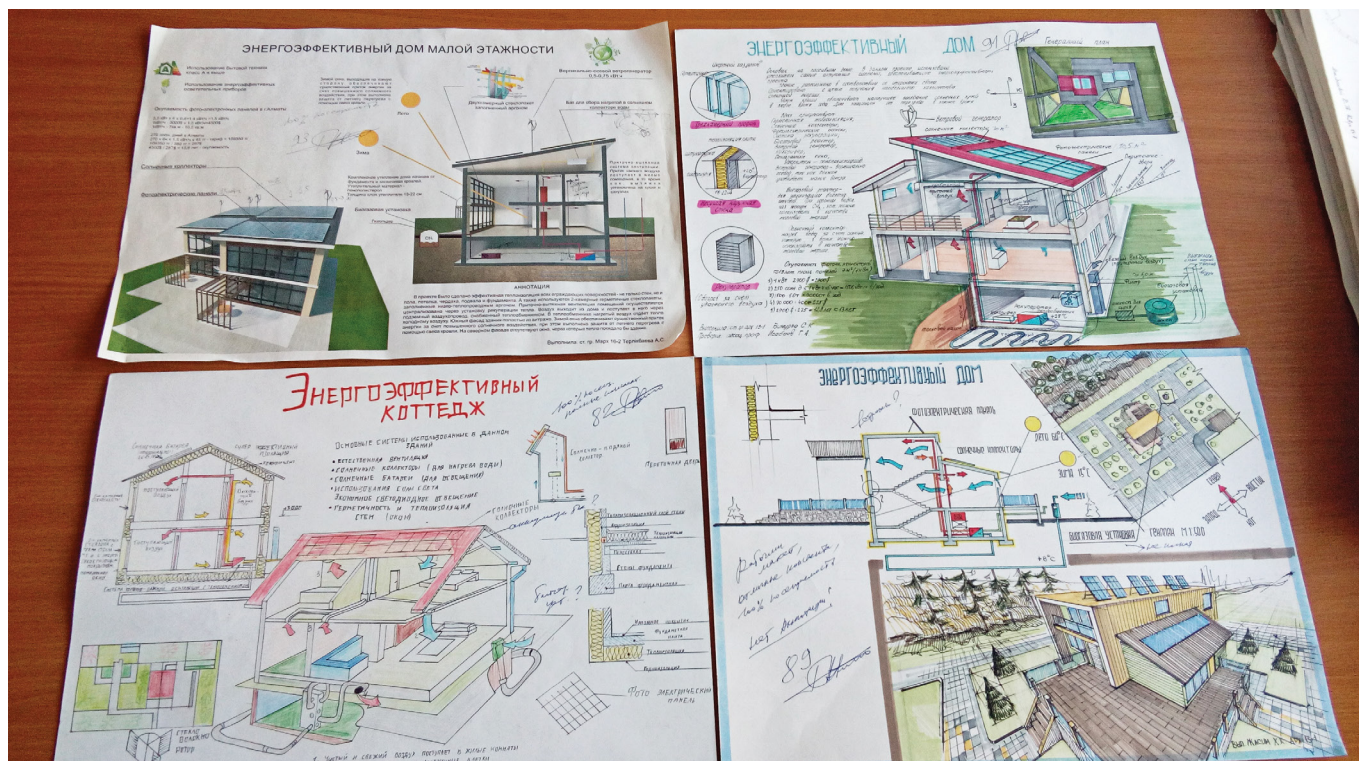


Figure (10) Examples of student works for the project “Energy-efficiency single-family house”.
The picture was taken with the teacher’s permission.

4.4.3 Regionalism

Regionalism or Regional architecture is the principal academic focus in KazGASA. As mentioned in the previous chapter, formal architectural education in Kazakhstan was established in 1961. During that period, the percentage of local Kazakh population in the country was only 29%. Coupled with the Soviet system of placement of workers, many architectural graduates from all over the Soviet Union were sent to work in Kazakhstan (Bronovskaya, Malinin, & Palmin, 2018, p. 26). The goal was to create a new style of architecture of Kazakh people by reinterpreting forms of national craft (Glaudinov et al., 1987 as cited in Abdrasilova, 2013). Consequently, in 1970s-1980s a regional architecture, notably, in Almaty reached great progress with the construction of iconic large scale projects that still define the architectural character of the city (Abdrasilova, 2013).

A collapse of the Soviet Union coupled with rapid globalisation and technological advancement of the country led to a renowned interest in developing and researching a regional architectural character of Kazakhstan (Abdrasilova, 2013).

There is also a requirement for regional connection. Even if a student sees something elsewhere, he will adopt it and think. Therefore, we can learn from the best example, but we require regionalism. Our school should have something different, and this is regionality. The first difference is seismicity, and then culture.

Overall, the attitude towards cultural identity and roots is changing in Kazakhstan. During the international accreditation, it was noted that national and cultural identities are important aspects of KazGASA.

4.4.4 Barriers and opportunities for organisational change towards sustainability in KazGASA

Barriers

The barriers listed below do not specifically refer to sustainability challenges or organisational change. However, those are barriers that interviewees face as part of the education system in KazGASA that, consequently, could hold up the integration of any initiatives related to sustainability.

Teachers and administration

The state

Bureaucratic and administrative bottlenecks on a state level were often mentioned preventing country-wide initiatives. As one of the interviewees said:

You would think we had EXPO [2017 in Astana], but there are lots of administrative barriers. The psychological barrier when we pass the examination [to present an architectural project to city committee] is very difficult.

Unfortunately, this law on renewable energy sources¹³ does not work in Kazakhstan. KEGOC [The Kazakhstan Electricity Grid Operating Company] cannot offer a good tariff to investors for green energy, which is the condition of the law... If there will be no powerful programme initiated by the state like in Western Europe, we will have no changes.

Both teachers and students repeated that it is hard to change the system in Kazakhstan in terms of embracing pro-environmental and pro-social behaviour.

13. Refers the adoption of the law on "Energy saving and increasing energy-efficiency" in 2012 (Paragraf, 2016). See Chapter 1 Background.

The issue is within our nation - mindset change is needed, and it should start from birth... When I came to work in KazGASA, I thought I would teach better than my teachers did, but turns out it is really hard to change the system.

Besides state bureaucracy, the economic challenges that universities face include 2015 devaluation of national currency tenge and inadequate funding from the state to private universities, which as mentioned above, led to increasing of tuition fees and an increase of the number of students. In 2018, there have been 25 students per teacher, and it used to be 7 students per teacher.

Education system

In the education system of the country, interviewees named the following issues:

Low level of basic education, especially among students from regions. Consequently, when students start higher education, they have a hard time comprehending the study programme. Several interviewees said that for change to happen children should be taught from an early age in families and kindergarten.

Bureaucracy in the education process. The Ministry (MES) request filling and signing many papers, and as an interviewee pointed out due to the large number of papers to fill, the teachers are more concerned with formal aspects than the development of the student's identity.

The current education system in Kazakhstan promotes technical education, and a negative consequence of this trend is cutting on humanities subjects. Universities have a choice of how many hours of humanities they include in the curriculum. In the case of KazGASA, disciplines like Sociology, Law, Political science and Religious studies have been combined into one course, giving students only general perspective.

Unfortunately, humanistic thinking is not developed among contemporary students, especially those with technical education. Many technical students do not know how to express their thoughts and read a few books.

Another negative consequence is a discussion to move “Architecture” from the arts to the technical category in the National Occupational Classification, which would cut the study time from the current 5 years to 4 years. According to senior teaching staff, 4 years are not enough to train a qualified bachelor of architecture. In many countries, to become a licensed architect a candidate should have 3-4 years of undergraduate and 2 years of graduate studies. However, this is not the case in Kazakhstan, and only a few pursue further graduate studies.

University level - KazGASA

On the university level, the barriers could be divided into curricular and operation.

Curricular:

- Both teachers and students mentioned a gap between theory and practical application of knowledge.
- Opposition and resistance to change
 - Opposition from teachers of general disciplines to module-based study programme initiative that leads to tension between teachers and departments
 - Internal disagreement between teachers on architectural studio teaching

Operational:

- Teachers have additional administrative duties resulting in lack of time to focus on teaching and research
- There are too many students per teacher. As a private institution interested in making more profit, KazGASA has very low acceptance threshold. According to interviewees, some

students come to study in KazGASA because they had no other choice.

- KazGASA has a dubious system of fining and rewarding teachers. Teachers are rewarded when students showcase good grades and fined when academic performance drops from average. Therefore, teachers are encouraged to raise grades artificially. It is related to a bureaucratic and formal approach to education, as well as surveying process that encourages teachers to be good rather than fair.

Students

Almost every teacher talked about youth passivity and students’ disinterest. The formal approach to education is also prevalent among students:

For them [students] the main goal is to pass exams, which is also a formal approach. Some students are not concerned with getting good knowledge but care about simply getting a good grade, or passing exams, getting a diploma, and so on. However, they are not concerned about their development; not all students understand the importance of self-education and their growth.

Few mentioned that students are overwhelmed as there are many courses, assignments and topics for courses are not connected. Consequently, information taught does not reach students lacking in-depth learning.

Sustainability issues are raised. For example, it is a project of a private house, from the beginning, during the introductory lectures, professors always touch upon the topics of passive house or energy-efficiency. However, not always this information is given to students in the right way because, in the end, they can not manage it, due to lack of time or something else. In the end, if they design a project, that is enough. So there is no in-depth learning of sustainability and energy-efficiency topics, although information is given on every stage.

Students

Most of the students have heard about terms sustainability and sustainable development, but they have a vague understanding of their meaning. Some students said that they were able to understand it better after my brief lecture. Despite this, students are aware of ecological, social and economic challenges that the country is facing. Majority of students, who actively participated in my lecture, said that they are interested in the sustainability topic and consider it valuable for their future career. It is worth noting that only a fraction of students actively participated in the Q&A session, while others either did not listen or stayed quiet.

From the student interviews and Q&A session after lectures, the following barriers were identified:

The barrier between students and teachers

There is a communication barrier between students and teachers. Students can not express their ideas openly; they are often corrected and put inside certain boundaries. There is a mental assumption among students that if they say something and it is wrong, the teacher would punish them. For people who have scholarships, making errors is even more critical. Therefore, it is hard to express opinions and have an open dialogue with teachers.

Dissatisfaction with teaching

Notetaking & irrelevant courses

While project-based courses have assignments that are graded, there are theory courses that grade students only based on the attendance and taking notes. Some courses have many technical details students fail to understand, possibly due to poor teaching. As one student pointed out:

Going against the system is hard. I do not think the problem is in a particular course; it is a continuation of the Soviet method of note-taking. In the US, it is different, they look at the results; but here if you made notes, you

must have learned something. There it is about deeper understanding; you can eat [in class] and not make notes, as soon as you understand. Here more attention is paid to discipline, making notes.

Notetaking was one of the most significant dissatisfaction of students with their educational experience, which they connected to the bigger issue of quality of teaching or grading based on formality rather than deep learning.

They do not care how deep do you understand the subject as soon as you made notes for every lecture.

I pay money for education, and not to make extensive notes. I would like to have discussions...I think it is very stupid to write a report by hand. I do not even look what I write; I just copy a Wikipedia article. It is not right.

One of the courses is philosophy. The course itself is not useless, but the assignments are and the way the course is taught not interesting. Why instead of just note-taking they do not discuss, debate in the class? There is a lack of interactive engagement. They write reports by hand, which is the last century.

Teachers who do not engage students.

They do not try to engage students either because they speak without interest [trying to excite students] or read from slides. There are also teachers who do not care and sit there until the end of class. However, some teachers are not interesting listen to.

Students who were very passionate about architecture also said that they would like to have more hours of architectural studio, experiment and work with materials instead of reading about them.

It feels like the teachers were just thrown into architectural school...They say our profession is cross-sectional (multidisciplinary), maybe this

is the reason why we have so many different disciplines. However, some people just want to do the architectural design.

There are many extra, not so important courses that take more time than architectural courses. I would like to have less of those courses, useless writing [referring to taking notes] and assignments, and have more focus on developing architectural skills and maybe architectural philosophy.

Lack of practical experience. It was another recurring complain, especially, among older students. According to student testimonials, despite learning theory, they do not know its real-life application, for example, the use of materials in the building design. In addition, working students say that the skills gained during their studies have very little help at work and they learned independently professional software.

Weak student organisations were mentioned less but considered necessary by some students. It was pointed out that while there is a student organisation in KazGASA, it organises only few social events, which are often irrelevant to their studies. A student said that other universities in Almaty offer better support to students to realise their ideas, projects and even entrepreneurial initiatives.

- Other barriers named by students that have been already discussed are:
- Lack of time that leads to rushing the project design without much conceptual investigation.
- Low admission threshold and the difference between students who want to study and become architects versus the ones who do not.
- A dubious system of fining: students pay fines for being late, disciplinary infraction, examination retake, and so on.
- Overall, it appears that students are not proud of their alma mater. As the older students get, the more cynical they sound about their educational experience in KazGASA.

Opportunities in KazGASA

Despite bottlenecks that administration, teachers and students face in KazGASA, there are also actions contributing to the improvement of the quality of the education process and, consequently, broader integration of sustainability topics. Those actions correspond with factors and recommendations listed in Table X, Chapter 2.

Collaborative decision-making

Currently, in KazGASA the process of making changes in the curriculum involves discussion within faculty council and methodological council. For example, when promoting a module based study programme, all involved teachers were invited to the discussion.

Although, the process faced resistance from some teachers of general subjects, according to an interviewee they tried “to convince them that the program should take into account both their and our viewpoints, and find some middle ground”.

Sharp (2002) points out the importance of dialogues and face-to-face interaction to bridge internal boundaries (Hoover & Harder, 2015), Temple (2010) suggests university management should utilise collective wisdom and share responsibilities, and Lidgren (et al., 2006) pointed out the influence of stakeholder dialogue on organisation’s evolution.

Based on interviews, it could be concluded that a collaborative decision-making process exists in KazGASA. Despite the tension between faculties and resistance to change from selected individuals, a single person or a group can not make decisions in the academy without a dialogue.

On the republican level, KazGASA leads the methodological union of architectural universities and, consequently, influences the curriculum development of all architectural-design undergraduate studies in the country. Twice per year union members come together to discuss methodological issues and curriculum development, as well as exchange knowledge and share literature.

Committed individuals

Cebrián et al. (2013) and other authors noted the importance of committed individuals and champions in institutional changes towards sustainability (Hoover and Harder, 2004). All teachers and administrative staff that I interviewed are very committed and engaged with their jobs. While I heard about “bad” teachers from students, all the teachers I talked with were passionate about architecture, teaching and further development for themselves. Although many of interviewees did not consider sustainability as a teaching priority or had limited knowledge of sustainability topics, they were open to new ideas and opportunities. Teachers participate in international conferences, workshops and exchange knowledge with their colleagues around the world.

Our teachers, professors, participate in city-planning forums, conferences, at the Congress of the union of architects, we go through further training in design institute - all these contribute to the diversity of our views. Consequently, what we consider as forward-looking and interesting, of course, we try to introduce [in teaching]. If not introducing new disciplines, then at least we change the content of existing disciplines because we change the study plans of disciplines every three years.

Teachers are the potential driving force behind the integration and transformation towards sustainability education in KazGASA. At this moment, KazGASA does not have initiatives and strategy for the integration of sustainable development on the organisational level. There is also no push from the state or the MES. However, teachers, faculty and methodological councils that define study programme of specialised architectural courses have included topics related to sustainability such as Energy Efficiency of Building, Human Life Safety (creating a comfortable environment for people), Environmental Protection, and so on. Teachers, while not sticking to the definition by the UN,

have a general understanding of sustainability and sustainable development within their discipline.

Openness to change

Overall, due to factors such as the transition of the education system in the country, requirements of international accreditation, interaction with the global community of architectural schools and increasing demands of the professional sector, KazGASA as an organisation continually faces changes. Subsequently, teachers and administration appear to be open-minded about new proposals.

Every year we have something called the State of Art, which is the state of science today where every teacher studies for two years what is happening in his field, in the development of his discipline. It is very stimulating because it is really useful. We understand what we are doing wrong, and what we should strive for. We organise a conference; we present, and, turns out, that it also pushes some changes in the curriculum.

Extra-curricular activities

From the perspective of students, they found valuable guest lectures, olympiads, scientific conferences and student competitions that KazGASA organises both on university and republican level. Several students mentioned that it was useful to work beyond standard study programme and communicate openly with teachers.

I have also asked interviewees what should be implemented in their opinion for them to improve the quality of education and increase the integration of sustainability topics.

State support was frequently mentioned as a crucial factor.

There should be a large-scale state program. We need to take examples from the best models of education in the West. This is simply a state problem.

In Germany, there is state support and tax deductions...It is necessary to include similar measures in our legislation; then it would be real.

Another suggestion was **bringing and training experts** “who have an understanding of what is sustainability and its global meaning” and introduce courses related to sustainability.

As previously mentioned, several teachers expressed concern with the trend of prioritising technical subjects and subsequent decrease of humanities hours. Therefore, it was suggested that humanities should be taught with equal attention as technical subjects to promote critical, creative, and pro-environmental thinking among youth.

On a more practical note, several teachers talked about being busy due to the increased number of students and additional administrative duties. They would have preferred to decrease the current workload to focus on teaching and doing research.

The next chapter connects research results with the literature review, analyses KazGASA as a system, and uses leverage points (Meadows, 1999) as a tool to suggest recommendations for interventions.



Figure (11) Department of Architecture in KazGASA.

Chapter 5: Discussion

This chapter aims to connect the interview findings with the thematic literature review in Chapter 2 and the systems 5approach introduced in Chapter 3.

- *5.1 Connecting to Literature Review* discussed the three themes from Chapter 2: sustainability in higher education, integrating sustainability in HEIs, and sustainability in architectural-design education with the research results. Specifically, Tables (X) and (X) compare barriers and opportunities from literature review to the ones found in the organisational structure of KazGASA.
- *5.2 KazGASA as a system* uses a systems approach to analyse the academy. Specifically, based on the case study of Lund University by Lidgren et al. (2006) on p. 27, I interpret the current state of KazGASA in relationship to the leverage points by Meadows (1999).
- *5.3 Leverage points: recommendations for intervention* provides recommendations for leverage points 8-1 and suggests Table (X) Curriculum model for the undergraduate architectural programme in KazGASA based on the existing curriculum in Chapter 4/ p.XX and the model by lulo et al. (2013) in Chapter 2/ p. XX.

Finally, the chapter discusses the suggestions for future research and research limitations (5.4, 5.5).

5.1 Connecting to Literature Review

Organisational change in HEIs towards sustainability is a challenge at all levels. It requires long-term planning and involvement of multiple stakeholders (Müller-Christ et al. 2014) and faces uncertainty and resistance to change from within the higher education system. Moreover, due to geographic, social and cultural differences, there are no adequate conditions for the successful implementation of sustainability in HEIs (Velazquez et al. 2005), and each case should be considered within its unique setting.

Currently, according to my research and interviews, in KazGASA sustainability topics are only moderately represented in the Education and Research areas, and sustainability is not considered as a priority. There are some topics related to sustainability within the existing courses. However, there is also an assumption that pro-environmental and pro-social factors are integral to architectural methods and already exist in the curriculum (Wright, 2003). Moreover, in KazGASA, the push to develop a course about energy-efficiency came from direct cooperation with UNDP, international partnership, the industry demand and changes in construction legislation. The government of Kazakhstan and the Ministry of Education and Science have not put enough efforts and resources to spread the sustainable development paradigm and include it as an integral part of the education process.

Within the current teaching about sustainability in KazGASA, it appears that an instrumental view is dominant. Sterling (2010, p. 513) described an instrumental view to “be based on a realist and materialist worldview” focusing on transmission of information. Based on interviews, the KazGASA courses, such as Energy Efficiency of Buildings and Ecology & Human Life Safety focus on teaching knowledge about green building techniques and design methods, including occupants health, safety and welfare. Regional Architecture of Kazakhstan looks into regional weather conditions of areas of Kazakhstan, construction materials suitable for

each area, and traditional forms of Kazakh culture. Those are significant and critical topics to teach. Nonetheless, according to the interviewed students, there is a lack of quality of learning experience that encourages critical thinking, which fits Sterling’s (2010) description of intrinsic values of education.

The tension between intrinsic/ instrumental views of education could be seen in the observation made by one of the interviewees about the formal approach to education prevalent in the academy. Among organisational barriers in KazGASA, it was pointed out that bureaucratic formalities have been prioritised over the quality of education. As a result, teachers are more occupied with filling paper, and students are more concerned with passing exams.

In Tables (6) and (7), I compare barriers and opportunities for integrating sustainability initiatives in HEIs from the literature review with the organisational barriers and opportunities found in KazGASA from interviews.

The Table (6) showcases that KazGASA experiences organisational barriers to integrating sustainability, which are common for other HEIs. On the other hand, because currently in KazGASA sustainability topics are only moderately represented, there is less correlation among opportunities in the Table (7). The missing cells demonstrate what areas KazGASA as an organisation could cultivate to integrate sustainability into the academy’s activities diversely:

- A systemic approach to organisational learning
- Infuse sustainability in all decisions
- Campus engagement through campus greening operations
- Sustainability declaration, policies, monitoring and indicators

It should be noted that those points are related to strategic move towards sustainability, which itself is possible when individuals and leadership in HEI behave according to the sustainable development philosophy (Velazquez, 2006).

5.1.1 Comparing barriers

Table (6) Comparing the organisational barriers found in KazGASA (Chapter 4/ pp. 62-65) with Table (1) Common barriers to integration of sustainability initiatives in HEIs identified from the literature review (Chapter 2/ p. 22) and Table (3) Barriers to sustainability education at UBC developed by Moore (2005a) (Chapter 2/ p. 28).

| Barriers from the literature review (Table 1/ p. 22 and Table 3/ p. 28) | | Existence in KazGASA according to interviews (Chapter 4, pp. 62-65) |
|--|--|--|
| The nature of Universities (Sharp, 2002) | <i>Discipline-based</i> | While not mentioned as a barrier during interviews, KazGASA is strongly discipline-based. |
| | <i>A culture of rationality and criticism</i> | There is an assumption that pro-environmental and pro-social factors are integral to architectural methods and already exists in the curriculum (the myth of rational university). |
| | <i>Competition</i> | |
| Individual worldview and lack of awareness | <i>Staff awareness and motivation</i> | Sustainability is not considered as a priority and tossed aside due to lack of time and lack of top-down support. |
| | <i>Denial and resistance</i> | Opposition from teachers of general disciplines to module-based study programme initiative and consequent tension between departments showcase the resistance of individuals to change and divert from the established standard study programme. |
| Monitoring and reward system | <i>Lack of commitment to sustainability policy</i> | Diverse understanding of the terms sustainability and sustainable development and due to lack of coherent definition of those terms. There is no sustainability-related policy. |
| | <i>Evaluation indicators</i> | Surveys do not evaluate and monitor criteria related to sustainability such as: <ul style="list-style-type: none"> • Material and energy efficiency in the operation of the campus |
| | <i>Rewarding</i> | <ul style="list-style-type: none"> • The dubious system of fining and rewarding teachers • Only good students are pushed forward discouraging other students |

Table (6) (continued)

| Barriers from the literature review (Table 1/ p. 22 and Table 3/ p. 28) | | Existence in KazGASA according to interviews (Chapter 4, pp. 62-65) |
|--|--|---|
| | <i>Misdirected criteria for evaluation (Moore, 2005a)</i> | <ul style="list-style-type: none"> Students and the academy's success is measured on factors such as employability and accreditation rating; A formal approach to the education - filling paper for teachers and passing exams for students - instead of getting good knowledge (intrinsic learning); Low admission threshold - an increasing number of students to increase profit instead, which negatively affects the quality of education despite the best efforts. |
| | <i>Unclear Priority setting and decision making (Moore, 2005a)</i> | Promoting technical education over humanities <ul style="list-style-type: none"> Cutting humanities hours Moving Architecture from arts to technical category |
| Organisation | <i>Power and organisational culture</i> | <ul style="list-style-type: none"> No mentioning of sustainability and sustainable development in the mission of KazGASA no top-down initiative for the integration of sustainable development on the organisation level |
| | <i>Lack of resources (funds, time, information flow)</i> | State: <ul style="list-style-type: none"> Economic situation (devaluation of currency in the country) Inadequate funding from the state Too many students per teacher Additional administrative duties for teachers Lack of time: students are overwhelmed with assignments and teachers have too much workload (high teacher to students ratio, additional administrative duties) |

5.1.2 Comparing opportunities

Table (7) Comparing the organisational opportunities found in KazGASA (Chapter 4/ p. 65) with the Table (2) Factors and conditions for the successful integration of sustainability initiatives identified from the literature review (Chapter 2/ p. 24).

| Factors and conditions from the literature review for the successful integration of sustainability initiatives (Table 2/ p. 24) | | Existence in KazGASA according to interviews (Chapter 4, pp. 65-67) |
|---|--|---|
| Universities as organisations | <i>Systemic approach and organisation learning</i> | |
| | <i>Collaboration and dialogue</i> | <ul style="list-style-type: none"> • Collaborative decision-making process • Openness to change |
| | <i>Infuse sustainability in all decision</i> | |
| | <i>Individual commitment</i> | <ul style="list-style-type: none"> • Dedicated staff member |
| Campus operations | <i>Campus engagement</i> | |
| | <i>Sustainability declaration, policies, monitoring and indicators</i> | |
| Engagement, community outreach, and partnerships | | <ul style="list-style-type: none"> • Participation in international conferences, workshop and exchange of knowledge that leads to update of curriculum • From the perspective of students, they found valuable guest lectures, olympiads, scientific conferences and student competitions that KazGASA organises both on university and republican level. |
| Curriculum | | <ul style="list-style-type: none"> • Teachers, faculty and methodological councils that define study programme of specialised architectural courses have included topics related to sustainability such as Energy Efficiency of Building, Human Life Safety (creating a comfortable environment for people), Environmental Protection, and so on. |

As I have already mentioned, within the boundaries of this research, the desired vision for KazGASA as a system is the embodiment of sustainability education by infusing it in all decisions regarding research, education, university's operation and partnership with outside communities. However, as an external observer, I understand that the scope of interview the results is not enough to propose a

vision or development scenario for KazGASA. I believe it would be quite pretentious to make such statements considering the limited time I spent in KazGASA.

Therefore, this research employs the systems approach to identify from the research results leverage points within a system where a small shift can lead to substantial changes.

5.2 KazGASA as a system

KazGASA is a system with:

- tangible elements (building, administration, departments, teachers, students, and so on);
- interconnections between them - degree requirements, the examinations and grades, the budgets and money flows, the relationship between people, and the communication of knowledge (Meadows, 2008, p. 14);
- purpose - educating future architects, designers and construction specialists while making a profit.

It is part of a larger higher education system in Kazakhstan, influenced by even larger systems on government and international levels.

As an established institution, KazGASA stocks (teaching capability, infrastructure, equipment, etc.) change slowly through the action of a flow (of students, knowledge, profit, government funding).

Based on the case study of Lund University by Lidgren et al. (2006) on p. 27, next I interpret the current state of KazGASA in relationship to the list of leverage points (see Box 5, p. 42) by Meadows (1999).

Meadows (1999) specifies that leverage points 12, 11, 10, 9 are less effective because they are physical parts of the system that require more time and resources to change. Furthermore, the first and the most powerful leverage point (The power to transcend paradigms) is non-attachment to any paradigm. It requires conscious understanding that even the paradigm that shapes our worldviews are limited, and the universe is “far beyond human comprehension” (Meadows, 1999, p. 19). Lidgren et al. (2006) did not use this leverage point due to its philosophical character that questions the foundation of its own rationality. As a result, to stay within the boundaries of KazGASA as a system, only leverage points 8-2 are discussed.

5.2.1 Leverage Points

8. The strength of negative feedback loops, relative to the impacts they are trying to correct against.

7. The gain around driving positive feedback loops.

Negative (or balancing) feedback loop is stability-seeking and aims to keep a stock at a given value or within a range of values (Meadows, 2008, p. 28). The strength of a negative feedback loop is important relative to the impact it is designed to correct. If the impact increases in strength, the feedbacks have to be strengthened too (Meadows, 1999, p. 10).

Positive (or reinforcing) feedback loops are self-reinforcing. The more it works, the more it gains the power to work some more. However, the system with uncontrolled positive loop ultimately will destroy itself, and usually, a negative loop will kick in to balance the system. Slowing a positive feedback loop is a more powerful leverage point than strengthening negative loops (Meadows, 1999, p. 11).

In the case of KazGASA, during a relatively stable state, the inflow of freshman students is balanced through 1) outflow of graduating students and 2) weeding out unsuitable candidates during the admission process. However, as mentioned above, currently KazGASA has more students (25 students per teacher) in comparison with previous years (7 students per teacher) due to lowering of admission threshold (weakening one of the balancing feedback loops). As a result, teachers have too much workload, classrooms are full, and consequently, according to interviewees, quality of educational experience is dropping.

6. The structure of information flows (who does and does not have access to information).

Meadows (1999, p. 13) states that “adding or restoring information can be a powerful intervention, usually much easier and cheaper than rebuilding physical infrastructure”.

KazGASA conducts around twelve surveys yearly. The results of the surveys are presented to the president of the academy and discussed during the faculty meetings or face-to-face with a specific teacher. I was not able to access survey questions or results as those are not publically available.

Teachers and administration have a positive attitude towards the surveys. However, their concerns lie with ensuring job security rather than improving the work environment. Also, despite measuring the moral and psychological climate in the team, teachers mentioned large teaching workload and bureaucratic tasks as significant barriers.

On the other hand, students did not express any opinion about the surveys and had no idea what happened with survey results. However, it seems clear that the surveys do not adequately evaluate the satisfaction of students with their educational experience. As there is no clear communication on the impact of surveys and what changes are being implemented, students have low trust towards the academy and quality of its education.

There are no indicators to monitor progress related to sustainability matters, including campus operation, energy and material consumption.

5. The rules of the system (such as incentives, punishments, constraints).

Meadows (1999, p. 13) state that the rules of the system define its scope, its boundaries, its degrees of freedom; and to understand the deepest malfunctions of systems, we need to pay attention to the rules, and to who has power over them.

The entire education system in Kazakhstan is depended on the rules set up by the Ministry of Education and Science. The MES defines standard study programme and allocates government funding to HEIs with international accreditation. As previously mentioned, there is the Strategic Plan of the Ministry of Education and Science for 2017-2021, which emphasises the importance of improving the

quality of education and upgrading organisational structure of HEIs but lacks attention towards sustainability education.

The Strategic Plan of the MES is depended on another rule(s) - policies and strategies set by the government of the Republic of Kazakhstan. Strategy 2050 aims to position Kazakhstan among the thirty most developed countries in the world by 2050. It is updated sub-strategy until 2025 is the closest state document in regards to UN Sustainable Development Goals.

It is worth noting that in the literature review, there is little mentioning of the connection between universities and government, perhaps, because higher education is more independent from the state around the world. However, in Kazakhstan government has substantial influence over HEIs politically and financially. Moreover, as one of the interviewee's mentioned, there are administrative and psychological barriers on a government level regarding sustainability initiatives, and one can only speculate about power interests involved in the process.

Joining the Bologna process changed the rule of the country's education system on the systemic level, bringing numerous ongoing changes. The next window of opportunity - processes of fundamental restructuring the university system (Müller-Christ et al., 2014) for higher education is Academic Freedom the state promised to give to HEIs in 2018. If implemented, academic freedom will give an opportunity to KazGASA to define and change curricula independently from the MES, as well as have more power of administrative and organisational decision-making.

4. The power to add, change, evolve, or self-organise system structure.

Self-organisation means changing any aspect of a system with less leverage in this list. It is the most potent form of system resilience because a system that can evolve can survive almost any change, by changing itself (Meadows, 1999, pp. 14-15). Lidgren

et al. (2006, p. 801) asked “What influences the people responsible for courses and educators, on all levels, to make changes in their curricula?”, and determined results similar to KazGASA. Changes in the curricula happen because a) employers seek new skills b) students ask for the change c) teachers introduce “new scientific knowledge emerges that is seen to be relevant to the subject” (Lidgren et al. 2006, p. 801).

They also mention the importance of stakeholder dialogue in the change-making process (Lidgren et al., 2006). The previous chapter discussed in detail the decision-making process existing in KazGASA, which involves both external and internal stakeholder. It is one of the most valuable organisational opportunity that would be pivotal for KazGASA after academic freedom.

3. The goals of the system.

The goal of KazGASA is to educate and produce future architects, designers and construction specialists.

More specifically, the administration of the academy put the big emphasis on the employability of the graduates, for example, by organising short-time summer internship for all students through partnerships with companies. The administration also aims to make a profit to maintain the operation of the academy.

Teachers at the architectural department aim to cultivate of an all-around identity of a person with broad views, to develop artistic and spatial thinking of students, prepare for professional practice and to tackle regional built environment challenges.

Despite it all, students are dissatisfied with their education and claim that the academy does not provide enough practical experience and industry-relevant skills. Students’ goal varies between being employed to becoming skilled architects.

It is worth noting that sustainability is not considered as a priority goal by all three subcultures - students, faculty, and administration.

2. The mindset or paradigm out of which the system — its goals, structure, rules, delays, parameters — arises.

According to Meadows (1999, p. 17) “The shared idea in the minds of society, the great big unstated assumptions — unstated because unnecessary to state; everyone already knows them — constitute that society’s paradigm, or deepest set of beliefs about how the world works”. Senge (2006) named them as mental models.

5.2.2 Mental Models

Common belief: nothing can change in Kazakhstan. The grass is greener somewhere else.

Students tend to believe that in Kazakhstan we have an awful system, and it should be perfect abroad. I think there was a shared negative opinion about our government and the overall system. Many blamed the “Kazakh” mentality to existing ecological or social problems. Overall, it seemed that younger participants think that everything is better somewhere outside of our country.

Judge the book by its cover

University administration and teachers pay attention to accreditation and other achievements to look good publically, rather than to develop deep learning among students. Students complain about the lack of practical teaching. Teachers show preference to “good students”. As one of the interviewees pointed out, there is a strong formal approach to education both among university staff and students. The administration aims to pass accreditation, receive an excellent rating, increase employment percentage. Teachers aim to have good academic performance (higher marks), participate in conferences, competitions, and receive a salary bonus. Students aim attention on passing the exam.

Discipline-based views or one-way street

Teachers are very focused on their respective disciplines. Consequently, they found it difficult to connect their discipline with sustainability challenges in a holistic way. For example, architecture teacher talked about architecture and society, architecture and environment. However, each of those interrelationships is viewed separately, without consideration of the overall system and complexity involved.

Students also found it very difficult to connect their studies with complex world challenges. Many of them are aware of ecological and social issues in the country, but could not respond to the question: “What do you think you can do as an individual to promote pro-environmental lifestyle?”

5.2.3 System archetypes

Related to feedback loops, the system archetypes reveal common management issues. Senge (2006) states that learning about system archetypes help to overcome the fractionation of knowledge. The system archetypes Eroding goals, Success to the successful, Growth and underinvestment are common issues described by Senge (2006). Coupled with the interview findings, below I am describing how those archetypes are manifested in KazGASA.

Eroding goals.

“A shifting the burden type of structure in which the short-term solution involves letting a long-term, fundamental goal decline” (Senge, 2006, p. 562).

The initiative to integrate module based study programme has started grand with the aim to restructure the architectural education completely. However, discussions and negotiations showed that not all teachers agree with a proposed initiative. General subjects should follow standard programmes set by the MES, so they can not be fully integrated with architectural subjects. Teachers from different faculties rarely meet each other due to

busy schedules. Consequently, while the integration process has started, targets were simplified and changes are limited to some architectural courses.

Success to the successful

Two activities compete for limited support or resources. The more successful one becomes, the more support it gains, thereby starving the other” (Senge, 2006, p. 565).

‘Good’ students are supported further. Only students with good marks are allowed to participate in conferences, Olympiads and international workshops. The university still accepts students with low marks, but over the time the difference between ‘good’ and ‘weak’ students increase, creating a vastly different educational experience and further decreasing trust towards the academy.

B - Negative (balancing) feedback loop
R - Positive (reinforcing) feedback loop

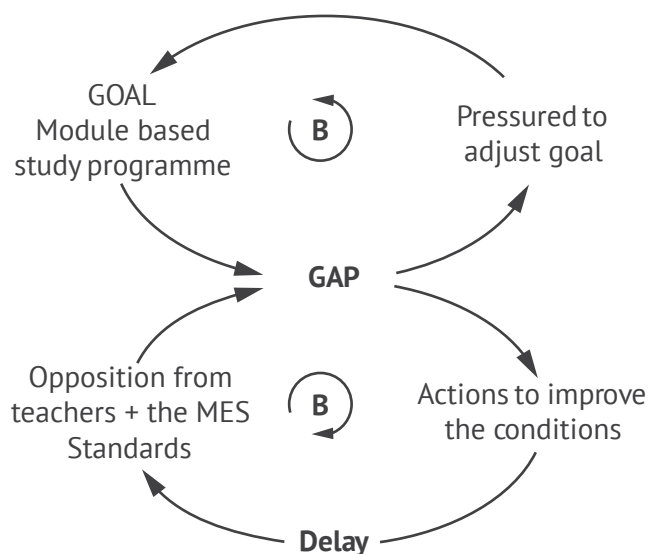


Figure (12). Archetype ‘Eroding Goals’.
Adapted from Senge (2006, p. 562).

Growth and underinvestment

The organisation's growth has reached a limit, and significant investment is needed to move forward. However, the investment is not made on time, and instead "key goals or performance standards are lowered to justify underinvestment" (Senge, 2006, p. 571). Lowering goals lead to lower expectation and poor performance, which results in more underinvestment.

The number of students, grow every year. However, a number of teachers are not growing accordingly. As a result, there are too many students per teacher. Teachers have lots of administrative duties in addition to teaching. Young teachers are quitting. Not so many young people want to be a teacher due to the bad personal experience of education. It is creating a bad cycle.

The next sub-section aims to offer recommendations for KazGASA to address each intervention place. The recommendations are developed by converging literature review, interview findings and systems approach.

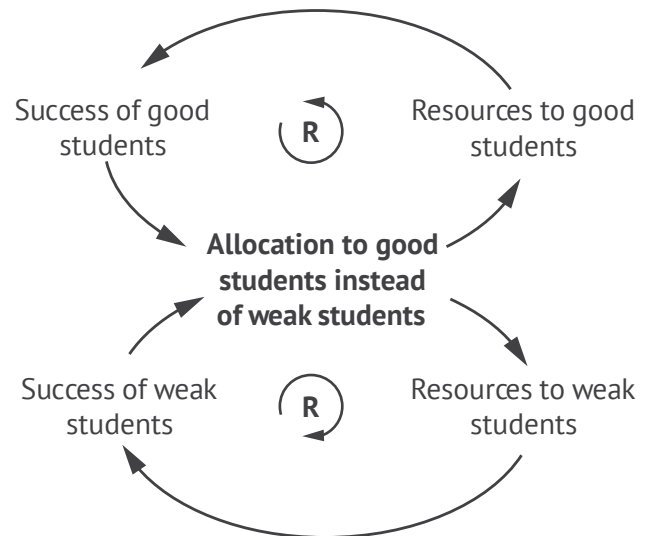


Figure (13). Archetype 'Success to the successful'. Adapted from Senge (2006, p. 565).

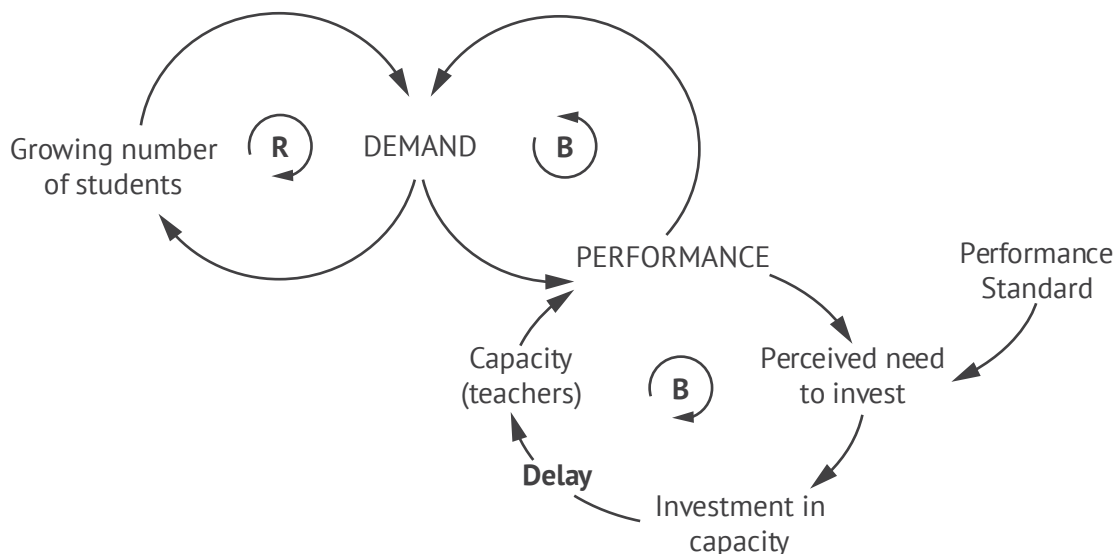


Figure (14). Archetype 'Growth and underinvestment'. Adapted from Senge (2006, p. 571).

5.3 Leverage points: recommendations for intervention

5.3.1 Suggested leverage points

8. The strength of negative feedback loops, relative to the impacts they are trying to correct against.

7. The gain around driving positive feedback loops.

There is a need to improve the quality of educational experience for both teachers and students by returning to the previous teacher/student ratio 1/7.

The most apparent solution include:

- Decrease number of students by toughening the admission process
- Increase the number of teachers

However, more students bring more income, which the academy needs due to low funding from the government. If the number of students decreases, then the tuition fees can increase. Currently, tuition fees are already quite high (around 2000€) and there are additional dubious fines.

At the moment, KazGASA offers competitive salaries and decent work hours to teachers if comparing with working in the industry (architectural-design studio, construction companies, etc.). Teachers who know English can have higher salaries and travel to international conferences and events. However, the academy has troubles recruiting new staff due to the unpopularity of teaching position because students and graduates are not proud of their alma mater.

It is possible to attract students to a career in teaching by instigating the interest from the early years. For example, adding a teaching assistant position could assist teachers with administrative tasks, bring some income to students while gaining

them practical teaching experience. Also, the academy can allocate additional scholarship for research-based master degrees needed to qualify for a teaching position.

In a long-term, it is important for the academy to avoid “underinvestment” in its most important stock - qualified and passionate teachers.

6. The structure of information flows (who does and does not have access to information).

According to Meadows (1999, p.13) “Missing feedback is one of the most common causes of system malfunction”. In KazGASA, students have low trust towards the academy and quality of its education. Also, there is a communication barrier between students and teachers and the tension between teachers and teachers. Therefore, it is crucial to restore the trust between students and the academy and improve the communication between subcultures.

KazGASA has already taken a step forward by implementing surveys, and much communication happens during the collaborative decision-making process. However, the results should be more openly accessible. Students should see that their voices matter to make changes in the academy.

Next step in future:

In terms of sustainability initiatives, there should include “appropriate instruments for monitoring, analysing, and controlling the performance of sustainability initiatives” (Velazquez et al., 2006, p. 816) on campus. Current surveying procedure could also be upgraded to monitor the sustainability performance of the campus. For example, the indicators could measure energy efficiency, material efficiency, composting and recycling, environmental

procurement, occupational health and safety, and accessibility (Velazquez et al., 2006) of KazGASA campus (see Figure 2, p. 29).

It is worth mentioning that at the moment neither the government of RK nor national accreditation schemes require such type of indicators. However, considering the government's ambitious goal of Strategy 2050, one can be sure that sustainability monitoring system will be adopted and required in the near future.

5. The rules of the system (such as incentives, punishments, constraints).

Currently, KazGASA does not have complete control to update curriculum, but academic freedom can offer the window of opportunity - a fundamental restructuring process (Müller-Christ et al., 2014).

Academic freedom aims to give independence to HEIs in Kazakhstan not only in terms of curriculum development but also regarding organisational structure. Therefore, KazGASA can develop strategies to improve the quality of educational experience and implement sustainability in four areas: education, research, outreach and partnership, and campus operation. *Sustainable university model* (see Figure 2, p. 29). by Velazquez et al. (2006) offers a comprehensive overview of what strategies for fostering sustainability could include.

4. The power to add, change, evolve, or self-organise system structure.

Lidgren et al. (2006) suggest to utilise stakeholder dialogue and strengthen student involvement.

Stakeholder dialogue and improvement of communication are interconnected. The collaborative decision-making process in KazGASA and existence of different councils already provide a solid foundation for the stakeholder dialogue. However, students are less involved in the process.

At the moment, only two students are invited to the faculty council meetings. Instead, representatives

from each year could be invited so that students have a more or less equal voice in the decision-making and access to information.

Next step in future:

According to Velazquez et al. (2006, p. 814), an essential factor for the sustainability education is "the establishment of a sustainability committee" to facilitate "the tasks of creating and establishing comprehensive campus-wide policies, objectives, and targets". A stakeholder dialogue could be a milestone for KazGASA towards establishing a university-wide sustainability committee.

3. The goals of the system

At the moment, the goal of KazGASA focuses on educating and producing specialists for employment. Employability of graduates is a critical factor, but there should be more emphasis on the professional responsibility, the purpose of design and development of individualistic ethics (Findeli, 2001) to establish a more profound personal, social, environmental and cultural connection (Design Accord, 2011) between young architects and their work.

There should be more emphasis on intrinsic values of education (Sterling, 2010) to avoid formal bureaucratic approach prevalent now in KazGASA.

Next step in future:

The professional responsibility and ethics apply to the operation of the academy as well. Velazquez et al. (2006) emphasize that to advocate sustainability in universities; university mission statement should be amended to include sustainability as one of the core values of their university (see Figure 2, p. 29).

2. The mindset or paradigm out of which the system — its goals, structure, rules, delays, parameters — arises.

To challenge the existing mindset in KazGASA - Nothing can change in Kazakhstan, Judge the

book by its cover, Discipline-based views or one-way street - there should be more exposure to the international academic and architectural community. The academy should continue investing in increasing knowledge base on English; partnerships with foreign universities; and participation in international conferences, competitions and workshops.

Next step in future:

For KazGASA to embody sustainability education, there needs to be a mindset change to conceptualise sustainability and what it means for the academy. Velazquez et al. (2006, p. 812) describe that “the strategic move towards sustainability begins when someone, or many people, in the university “dreaming about or envisioning” the possibility that the institution’s members behave according to the sustainable development philosophy”. For KazGASA, foremost it is essential to define the terms sustainability and sustainable development to integrate the concept into mission and policies.

The next section discusses the opportunities for curriculum development.

5.3.2 Introducing sustainability topics into the curriculum

Academic freedom gives a window of opportunity for KazGASA to introduce more sustainability topics into the curriculum.

At the moment, there are some topics related to sustainability within the existing courses. Even without the campus-wide sustainability strategies, teachers, faculty and methodological council can decide to increase sustainability topics in the curriculum, for example, due to demands from the international academic community and labour market.

KazGASA can:

- Start an introductory course about the challenges the world faces and sustainable development.
- Integrate real-life sustainability challenges into studio briefs. Table (8) shows the Curriculum model for undergraduate architectural-programme in KazGASA based on the existent curriculum and the model by Lulo et al. (2013).
- Require students to take into account sustainability challenges when development studio projects.
- Introduce sustainability themes to competitions and scientific conferences organised by KazGASA.
- Provide training and education for teachers and administrators
- Increasing teachers’ knowledge about sustainability, energy efficiency and green construction.

Table (8) Curriculum model for undergraduate architectural-programme in KazGASA based on the model by Iulo et al. (2013) (Chapter 2, Table 4/ p. 33) and the existing curriculum (Chapter 4, Table 5/ p. 59).

| Current study programme in KazGASA | | Environmentally conscious themes based on a model by Iulo et al. (2013, pp. 444-445) |
|--|--|---|
| Year 1 | | |
| Term 1 | Term 2 | |
| Foundation of Architectural Design Kazakh/ Russian Language Communication Technologies Drawing & Painting 1 Engineering Drawing 1 Architectural Composition Mathematics Art History and Culturology | Architectural Studio 1 (Design of small-scale architectural forms) Modern History of Kazakhstan Foreign Language (English) Kazakh/ Russian Language Architectural Graphics and Model-making Painting AutoCAD Construction Materials | The individual and the environment: Introduction to science, history and ethics of climate change and emerging sustainability paradigm |
| Year 2 | | |
| Term 1 | Term 2 | |
| Architectural Studio 2 Foreign Language (English) Kazakh/ Russian Language Sociology, Politics, Law & Religion (combined) Introduction to Economics Architecture 1 Engineering Drawing 3 Sculpture 1 Professional Software 1 | Architectural Studio 3 Philosophy Industry Related Foreign Language (English) Industry Related Kazakh/ Russian Language Architectural Drawing World Architecture History Professional Software 2 (3D Modelling) Geodetic Surveying | Environmentally responsible site-building interaction (site, material, and construction): Introduction of basic environmental planning strategies in architectural design by evaluating the site, the embodied energy of materials, and the energy efficiency of design, materials and construction techniques. |
| Year 3 | | |
| Term 1 | Term 2 | |
| Ecology & Human Life Safety Architectural Studio 4 History of Architecture in Kazakhstan Professional Software 3 Engineering Mechanics Architectural Physics | Architectural Studio 5 Introduction to Economics Engineering Systems Of Buildings and Infrastructure Building Construction 2 Urban Environment & Landscape Technologies of Construction Manufacturing Introduction to City Planning | The building as an environmentally conscious system: Consolidation of environmental planning strategies and sustainable concepts in architectural design by integrating energy responsible technical systems (daylighting, insulation, natural ventilation, mechanical systems, and others). |

Table (8) (continued).

| Current study programme in KazGASA | | Environmentally conscious themes based on a model by Iulo et al. (2013, pp. 444-445) |
|--|---|---|
| Year 4 | | |
| Term 1 | Term 2 | |
| Architectural Studio 6 Introduction to Law Introduction to Human Life Safety Landscape Architecture City Planning Economics and Underground Urbanistics Engineering Development and Transportation Building Construction 2 | Architectural Studio 7 Architecture Of Unique Buildings Regional Architecture Construction Drawings Modern Construction Materials | The interrelationships between the building and the urban environment: Exploration of the synthesis of individual buildings, groups of buildings, service systems and the urban realm to understand the inter-relationships between the physical conditions and individual needs (social and cultural conditions) in the urban environment. |
| Year 5 | | |
| Restoration of buildings and communities Project Budgeting Final Graduation project | | Comprehensive, environmentally conscious design: Exploration of the expressive and theoretical potential of environmentally conscious design. |

5.4 Suggestion for future research

As an external observer, the description of processes and interactions happening in KazGASA are limited to my interviews and observations. Therefore, to develop entirely adequate recommendations, a representative from each subculture in KazGASA should be part of a dialogue.

To add a designerly component to the research findings, there is an opportunity to co-design the future of KazGASA within sustainability education paradigm. The next step could include organising co-design workshops, engaging KazGASA stakeholders in a participatory design process and developing scenarios for the future.

Design workshops consolidate creative co-design methods such as collage, mapping, or diagramming exercises into organised sessions for several participants. The method is also used to train interested audience in design thinking, which is currently trending in corporate training. It can expose participant from various background to the prevalent methods of design research, ideation, thinking, and processes (Martin & Hanington, 2012).

Participatory design involves active consultation with users, clients, and other stakeholders in the design process (Martin & Hanington, 2012). There is an opportunity to involve external stakeholders of KazGASA including residents of Almaty city and representatives from other architectural schools in the country.

A scenario is a believable narrative created to envision key interaction of the user with a system. It is a widely used strategic planning tool to establish a shared vision and both short-term and

long-term goal (Martin & Hanington, 2012). Going back to the 2nd leverage point, a mindset change to conceptualise sustainability can be part of the design workshop and scenario building. However, it is a complex process requiring time, enthusiasm from management leadership and a designer experienced with facilitation and co-design.

From the perspective of research on sustainability in higher education, there is a need for broad research on the integration of sustainability in the education system in Kazakhstan. Despite the government's commitment to UN 2030 Agenda, the actual implementation of Sustainable Development Goals in the country is dubious.

Broad research can review in detail:

- The existing policies and strategies by the Ministry of Education and Science of the RK;
- How those strategies are being incorporated in pre-school, primary, secondary, undergraduate and graduate education;
- What are the barriers that the education system, including barriers to implementation of sustainability;
- What are the leverage points for wide-scale implementation of sustainability topics on all levels of educational experience.
- Finally, developing plausible scenarios for the actual implementation process.

5.5 Limitations of the research

Time and language are the key limitations of this research.

Regarding time, as mentioned in Chapter 3, the first field trip was organised in a rush without proper preparation and selection of interviewees. The study schedule in KazGASA justified the rush. I travelled in mid-April because examination period starts in May followed by internship and summer holidays in June-August. The academic year begins in September and, as a result, I could conduct the second round of interviews only in October. Living in Finland until September 2018, it was hard to access people in KazGASA, and secondary research was limited to online information. After moving back to Kazakhstan, I was able to gather necessary information.

Although interviewees give a fair representation of subcultures in KazGASA, some members are represented less. For example, I was able to arrange interviews with only one general subject teacher and one senior academic administration member. Among students, only students with an excellent academic record were willing to give me interviews. There are no representatives from management and support staff. Overall, the selection of interviewees could be improved to represent a larger population by gender, ethnicity and position in KazGASA. It would have been great to have a representative from the Ministry of Education and Science. Despite thorough secondary research and interviews, I still could not fully comprehend the interaction between KazGASA and the MES.

Regarding language limitation, despite my best attempts to select the correct interpretation during the translation process, there is still a layer of subjective interpretivism. Besides, as I mentioned, interviewees were looking for my approval of their answer and often used the same words that I used in questioning.

On a personal level, the research process slowed down due to my insecurities and doubts about research topic and methods. Having a full-time work half of the research period, immense psychological pressure in a way “eroded” goals of this research limiting it to theoretical exploration.

Conclusion

Summary

The research started with the questions: *What is the status of sustainability initiatives in KazGASA?*, following up with *What are the leverage points within KazGASA as a system that could potentially lead to large changes towards sustainability education?*

During two field trips, I conducted 14 interviews with students, faculty and academic administration members in KazGASA. In combination with the secondary research, the interview findings (Chapter 4) revealed the organisational structure of the academy (the mission, goal, stakeholders and partnership). Moreover, Figure 9 (Chapter 4, p. 56) showcases the decision-making process and the interaction between internal, external and international stakeholders from both bottom-up and top-down approaches. Also, the research identified the state of sustainability topics and organisational barriers and opportunities for integrating sustainability initiatives in KazGASA.

In Chapter 5, a systems approach is used to analyse KazGASA as a system to 1) identify feedback loops (reinforcing and balancing feedbacks), system archetypes, and mental models that could result in undesired system's state; 2) to propose a desired state of the system using leverage points (Meadows, 1999) as a tool. Within the boundaries of this research, the desired vision for KazGASA as a system is an embodiment of sustainability education by infusing it in all decisions regarding research, education, university's operation and partnership with outside communities. However, as an external observer with limited exposure to KazGASA, it would have pretentious to propose a vision or development scenario for the academy without the involvement of all stakeholders.

Therefore, based on literature review and interviewees, and using leverage points as a tool (Meadows, 1999), the research gives recommendations that could foremostly lead to the improvement of the quality of educational experience in KazGASA towards sustainability education (see Table 9).







In addition, Table 8 (p. 81) suggests a curriculum model for the undergraduate architectural programme in KazGASA, which is a combination of the model by lulo et al. (2013) (Table 4/ p. 33) and the existing curriculum (Table 5/ p. 59).

Value of the research

The research explores the broad topic of sustainability in higher education by focusing on the undergraduate architectural education in Kazakhstan. Specifically, the case study examines Kazakh Leading Academy of Architecture and Civil Engineering (KazGASA), a leading higher educational institution in Kazakhstan in the field of architecture, design and construction.

While there are many case studies about sustainability in HEIs or sustainability in architectural education, based on the search in international peer-reviewed journals, no such studies were conducted in Kazakhstan. There are scarce research papers on the state of sustainability initiatives in government and education system in Kazakhstan and Central Asia generally. Therefore, on a broader sense, the research offers unique country-based perspective by looking into the literature review on SHE and architectural education, as well as strategic plans by the government of Kazakhstan and the Ministry of Education and Science of RK.

Table (9) the summary of recommendation for each leverage point in increasing order of effectiveness.

| Leverage point by Meadows (1999) in increasing order of effectiveness | Recommendations for each intervention |
|--|--|
| 8. The strength of negative feedback loops, relative to the impacts they are trying to correct against. |  <p>Maintain quality of education despite increasing inflow of students by relieving the workload of teachers and increasing number of teachers.</p> |
| 7. The gain around driving positive feedback loops. | <p>Suggestions: TA positions for students to help teachers with the workload and to instigate their interests in teaching.</p> |
| 6. The structure of information flows (who does and does not have access to information). |  <p>Improve trust of students towards the academy and remove the communication barrier between student and teachers.</p> <p>Suggestions: Have surveys result more open for discussion students and the general public to showcase that their voices matter.</p> |
| | <p>Next step in future: Based on the current surveying procedure, measure sustainability performance of the campus by having appropriate instruments for monitoring, analysing and controlling sustainability initiatives (Velazquez et al., 2006).</p> |
| 5. The rules of the system (such as incentives, punishments, constraints). |  <p>Use the MES draft on academic freedom (p. XX) as the window of opportunity to develop strategies to implement sustainability in education, research, outreach and partnership, and campus operation.</p> |
| 4. The power to add, change, evolve, or self-organise system structure. |  <p>Improve stakeholder dialogue (Lidgren et al., 2006) by increasing the involvement of students in the collaborative decision-making process.</p> <p>Next step in future: Establish a sustainability committee (Velazquez et al., 2006).</p> |
| 3. The goals of the system. |  <p>Avoid formal bureaucratic approach to education prevalent now in KazGASa by emphasising intrinsic values of education (Sterling, 2010) such as the depth of learning experience and professional ethics and responsibility.</p> <p>Next step in future: Include sustainability as one of the core values in the academy's mission (Velazquez et al., 2006) to reflect professional responsibility.</p> |
| 2. The mindset or paradigm out of which the system – its goals, structure, rules, delays, parameters – arises. |  <p>Increase exposure to international academic and architectural community to challenge the existing mental models in KazGASA.</p> <p>Next step in future: Conceptualize sustainability (Velazquez et al., 2006) and what it means for the academy. Foremost, it is essential to define the terms sustainability and sustainable development in the academy's mission and policies.</p> |

Personal reflection

Despite “eroding” my initial ambition about this research and limiting its designerly component, I have grown immensely throughout the last year. From a researcher perspective, my main learning outcomes are evolvement of research and writing skills, and using methods in a way that Cousin’s (2009, p. 2) described as being “in the service of the researcher, not vice versa”. I learned to cast aside my assumptions and question my mental models, including the ones regarding my career perspectives.

A multidisciplinary approach that Creative Sustainability programme employs was valuable in the process of unveiling the previously unknown territory of an organisational structure of higher educational institutions. At this point, I believe to possess some degree of expertise in the topic of sustainability in higher education.

Lastly, it was a personal attempt to contribute to the knowledge base for the sustainable development of my country. Despite living abroad for many years, I am a patriot of Kazakhstan and dream about the country free of corruption and with effective government policies and social values to ensure meeting “the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987).

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